Methow Valley Irrigation District Project
PRELIMINARY Environmental Assessment
East and West Diversion Screening Proposal

BPA Project # 1996-034-01

Prepared by:
Bonneville Power Administration

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Administrative Summary

Funding Agency: U.S. Department of Energy, Bonneville Power Administration
Proponent: Methow Valley Irrigation District

Name of Proposed Project: MVID East and West Diversion Screening Proposal

Abstract: Bonneville Power Administration proposes to assist the Methow Valley Irrigation District by funding the replacement of existing fish screens located along their East and West diversion canals. The East and West diversions are along the Methow River and Twisp Rivers, respectively, in Okanogan County, Washington. The existing screens, which were constructed decades ago, are deteriorating and do not meet current Federal and state standards and criteria for safe and effective fish passage. Both diversion sites are used by anadromous salmonids including Chinook, sockeye, and coho salmon, and steelhead. Non-migratory resident fish in the Methow and Twisp systems include rainbow, brown, brook, cutthroat/rainbow hybrid, and bull trout, and mountain whitefish.

The proposed fish screens would replace the existing screens to meet current Federal standards and provide fish protection at the entrance of the MVID diversion canals. Because this action has, in part, been addressed in an environmental assessment previously prepared by BPA in 1997, we make reference to that document. In addition to the proposed (preferred) action, BPA has been asked to consider an action alternative (Alternative 1) that is essentially the same as Alternative A in the original 1997 EA. This alternative includes the conversion of the MVID irrigation system from surface water withdrawals to a pressurized pipe groundwater system. The no action alternative (Alternative 2) is also examined.

The proposed action would result in some short-term, localized construction-related impacts such as soil and vegetation surface disturbance, temporary displacement of wildlife, and localized noise. The long-term benefits include fish protection and conservation, improved fish movements around the new fish screen facility, prevention of entrapment and entrainment, compliance with accepted NOAA Fisheries' standards and criteria for screening and passage, and improved fish returns. Cumulative effects of reasonably foreseeable MVID irrigation system actions are also addressed.

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2. call toll free at 1-800 622-4519; or
3. email us at: comment@bpa.gov.

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CHAPTER 1 NEED FOR AND PURPOSE OF ACTION

Bonneville Power Administration (BPA) has received a request from the Methow Valley Irrigation District (MVID) to fund the replacement of two fish screens along their East and West Diversion canals. On August 15, 2003, the Northwest Power and Conservation Council recommended that BPA provide funding for replacement screens at the MVID diversions. Because BPA is the primary potential source of funding for the proposed project, it is acting as the lead agency under the National Environmental Policy Act (NEPA). Once this environmental assessment (EA) is completed, BPA may then decide whether or not to fund activities related to the proposed project.

This preliminary EA is intended to supplement a 1997 BPA environmental assessment that examined a broader scope of actions and alternatives for the MVID (BPA, 1997b). The fish screening action currently proposed for BPA funding is a smaller component of and has a smaller scope than an overall larger rehabilitation plan for the MVID, and has considerable overlap with the alternatives of the 1997 document. Therefore, we rely on information contained in that 1997 EA and repeatedly reference various chapters from that document.

1.1 Underlying Need for Action

The MVID currently operates two diversions to feed water to their irrigation system: one on the Methow River and one on the Twisp River, both located in North Central Washington. Although fish screens have been in place on each of the two diversions since the 1930s, fish screens constructed in the state of Washington in the 1930s through 1970s do not comply with currently accepted biological protection standards and criteria for juvenile salmonid fish. Old screens typically provide fair protection from injury/mortality for large yearling smolts (4-6-inch long), but inadequate protection for fry and fingerling life stages. Improperly screened irrigation canals, or screens that are in disrepair or outdated, may cause injury and mortality of fry and fingerlings and may hamper efforts to increase depressed salmon and steelhead populations.

The National Oceanic and Atmospheric Administration – National Marine Fisheries Service (NOAA Fisheries) has documented that juvenile Chinook salmon and steelhead (among other fish species) are making their way behind the MVID fish screens and being diverted into the canals and dying, due to stranding either in the canals or in the irrigators' fields. NOAA Fisheries investigations, concluded that the MVID water diversions and screens were causing "take" as defined under the Endangered Species Act (ESA) (Nordlund, 2002; Nordlund, 2000; Carlson, 2002). The studies further identified that mortality and injury of juvenile salmonids would likely occur due to inadequate fish screens in both canals. These fish species are listed as endangered under the Endangered Species Act (ESA). The underlying need for action is to prevent this loss of endangered juvenile fish. BPA is responsible for protecting and conserving listed threatened and endangered species under the ESA, as amended. Funding a project to prevent endangered species from take would assist BPA in fulfilling its ESA responsibilities.

The current MVID screen designs are deteriorating, outdated, and ineffective, and do not meet current regional fish screen biological protection criteria adopted by the Columbia Basin Fish and Wildlife Authority Fish Screening Oversight Committee of 1995; nor do they meet the fish screen design standards and criteria of the NOAA Fisheries and state of Washington. The screens at the East Diversion canal are noncompliant with the screen angle orientation criteria, and thus may exceed approach velocity criteria. These screens were temporarily re-meshed

with 3/32 inch mesh to conform with NOAA Fisheries criteria in 2000 at MVID's expense. The new mesh was simply wrapped over the ¼ inch mesh of the old screens as a temporary measure. Since that time, the new mesh has deteriorated to the point where mesh breaks and gaps are appearing. This re-meshing also decreases the screen's ability to pass water by decreasing their effective area. As a result, MVID has been unable to divert sufficient water to supply their users through these screens without exceeding approach velocity limits. A similar situation exists at the West canal screens. These screens are perpendicular to the stream flow; do not provide any sweeping velocity along the screens; the screen size is insufficient to pass 30 cubic feet per second (cfs) at an approach velocity of 0.4 feet per second; the trash rack is located upstream of the drum screen face; and the drum screen provides insufficient water control over the water surface at the screens. These deteriorating and outdated fish screens contribute to reduced movement, passage, and survival for ESA-listed fish in the Twisp and Methow Rivers and require correction to maximize opportunities to restore depressed runs of ESA listed species.

The MVID must comply with a consent decree with NOAA Fisheries that requires the district to take certain steps to avoid violating the ESA (see chapter 1.3.2 regarding the consent decree). In order to do this, the MVID needs to either replace the noncompliant fish screens, discontinue the current irrigation system, or select another viable alternative. The MVID agreed to comply with fish screen criteria by the Spring of 2004, in a consent decree negotiated in Federal court (see chapter 1.3.2). Implementation of the proposed action in this EA would, in part, meet the consent decree responsibility and halt the unlawful take of ESA-listed fish.

The proposed action is also needed to allow BPA to meet its obligations under the Pacific Northwest Electric Power Planning and Conservation Act (Act). Development of the hydropower system in the Columbia River Basin has had far-reaching effects on many species of fish and wildlife. According to this Act, BPA is responsible for protecting, mitigating and enhancing fish and wildlife affected by the development, operation, and management of Federal Columbia River Power System (FCRPS) hydroelectric facilities on the Columbia River and its tributaries (see Pacific Northwest Electric Power Planning and Conservation Act, 16 U.S.C. 839 et seq., Section 4(h)(10)(A)). To accomplish this goal, the Act requires the Northwest Power Planning Council (recently renamed the Northwest Power and Conservation Council; hereinafter Council) to develop a program for fish mitigation and enhancement, and requires BPA to fulfill its mitigation duties in a manner consistent with the program. One of the projects recommended by the Council is the MVID East and West Diversion screening proposal. The NOAA Fisheries ESA Section 7 Biological Opinion for the FCRPS also calls for BPA to protect and improve the habitat of listed fish, including those affected by the MVID. Providing funding for the proposed action would assist BPA in fulfilling its obligations as mandated under the Act, and would expedite protection of the listed Methow and Twisp river fish.

1.2 Purpose of Action

BPA has identified the following purposes for participating in this project. BPA will base its choice among the alternatives on these purposes:

- Prevent losses of anadromous and resident fish to the MVID irrigation system;
- Improve fish passage;
- Assure MVID members continued access to water supplies;
- Achieve cost and administrative efficiency; and

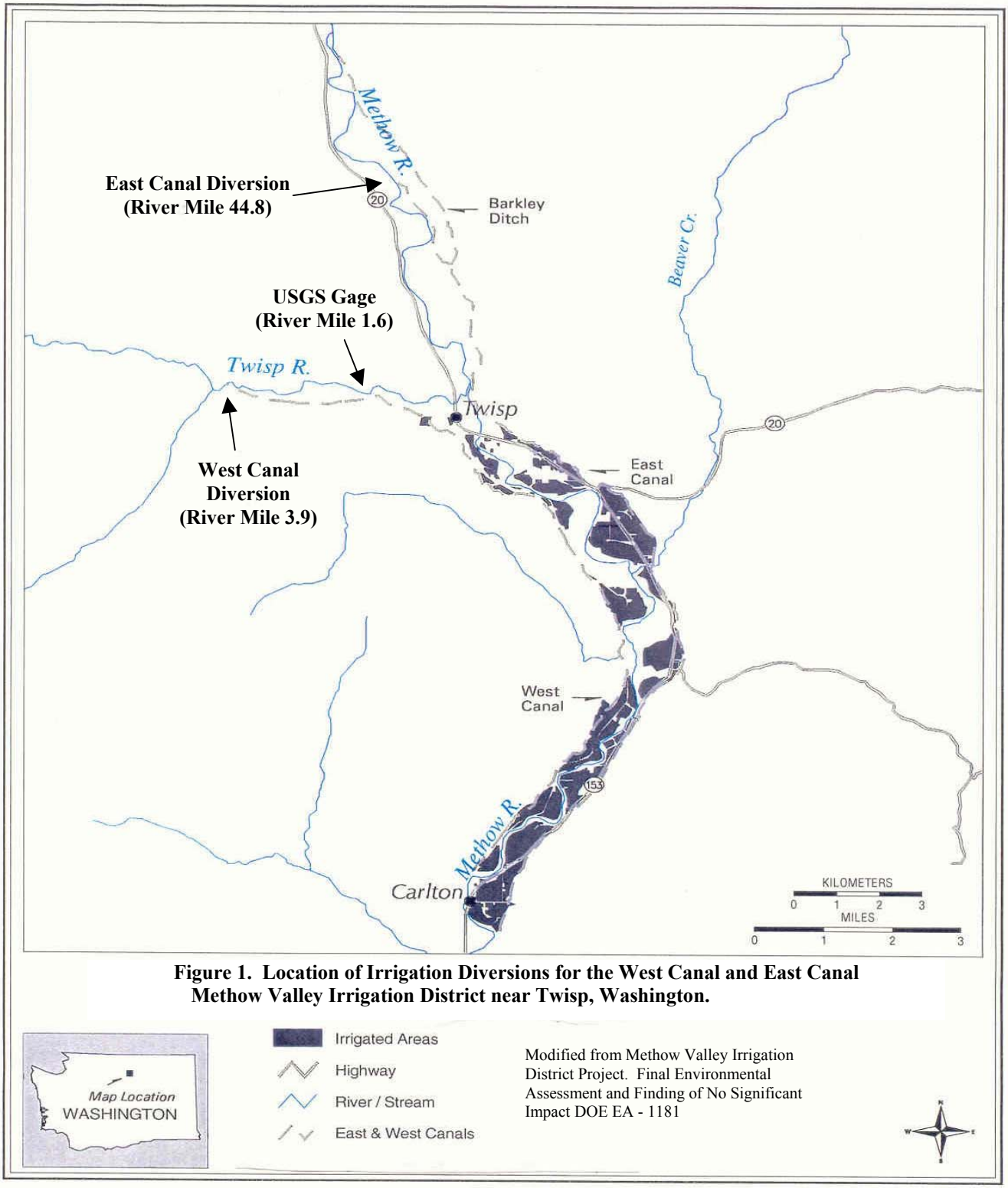

Figure 1. Location of Irrigation Diversions for the West Canal and East Canal Methow Valley Irrigation District near Twisp, Washington.

- Comply with all applicable laws, regulations, and Executive Orders.

1.3 Background

Figure 1 provides a map overview of the MVID, including the locations of the diversions and their juxtaposition to the Methow and Twisp Rivers. Lands irrigated by the MVID are also shown.

The proposed fish screen replacement project is part of a larger, more complex set of actions to rehabilitate the MVID irrigation system. These actions were examined in the Methow Valley Irrigation District Project-Final Environmental Assessment and Finding of No Significant Impact (DOE/EA-1181) that was prepared by BPA in 1997 (BPA, 1997b). The broad goals of the larger rehabilitation effort are to increase the efficiency of the irrigation system, improve instream flows for fish and water delivery throughout the system, correct fish passage problems that have been identified in several studies of fish and water issues in the Methow Basin, and institute water conservation in the MVID through on-farm irrigation equipment replacement and educational programs.

1.3.1 Historical Perspective

This chapter provides a brief overview of the history behind the Methow Valley Irrigation District and the project. More detail and historical references may be found in BPA (1997b), Montgomery Water Group (1996), Okanogan County (1994), Washington Pollution Control Hearing Board (2003), and a variety of other reports.

The MVID canal system has been part of the Methow Valley's primarily fruit-growing agricultural production during its years of operation from the early 1900s to the present. The first efforts at irrigation were in the 1880s, but after 1900 there were larger scale and more organized irrigation attempts in the valley. In 1919, farmers and orchardists created the MVID. In providing water to the irrigators, the district has experienced various challenges and conflicts including fish passage problems around the diversions, critically low stream flows downstream of the diversions that have been harmful to anadromous and resident fish, high conveyance losses, and the maintenance of an economically viable irrigation water supply for its members.

Fish population declines were reported in both the Methow and Twisp Rivers shortly after construction of the MVID system, and much of the loss was attributed to downstream-migrating juvenile fish being drawn out of the rivers and into the irrigation system where they often died. The original fish screens built on the East and West canals were installed in 1937 to prevent entry of fish into the irrigation system. In 1967, the East canal screen's concrete structures were demolished and rebuilt, and the screens were also remeshed (pers. com. Eric Egbers, WDFW Oct. 10. 2003). The West canal screens were replaced in 1976 (Archaeological and Historical Services 1996).

The overall water conveyance efficiency of the MVID system (i.e., current demand for irrigation water divided by the total amount of water diverted) has been estimated to be as low as 20 percent (Montgomery Water Group, 1996), although seepage evaluations conducted by the Bureau of Reclamation (BOR) in 2003 indicate that efficiencies may presently be somewhat higher. Water conveyance losses in the canals occur due to evaporation and canal leakage.

The need to increase the efficiency of the irrigation system, improve instream flows for fish in the Methow and Twisp rivers, and correct fish passage problems has been identified in a variety of legal documents and studies in the Methow Basin since the 1980s. There has been much dialogue and debate between the MVID, various state and Federal agencies, and Tribes over the best practical rehabilitation and management strategies for the irrigation district:

- 1988 - The Washington Department of Ecology (WDOE) issued an order (DE 88-C386) requiring the MVID to rehabilitate its system or curtail water use.
- 1990 - The Washington Department of Wildlife et al. (1990) published a Methow and Okanogan River Subbasin Salmon and Steelhead Production Plan that identified problems with the MVID irrigation system.
- 1990 - The Klohn Leonoff study, commissioned and completed by WDOE and MVID, addressed significant issues such as poor maintenance and inefficient water use of the canal system (Klohn Leonoff Consulting Engineers, 1990).
- 1991 - The Yakama Nation filed suit against the WDOE and MVID for failing to implement the measures recommended in the Klohn Leonoff report and enjoin the MVID's wasteful water practices.
- 1994 - The Methow Valley Water Pilot Planning Project prepared a Draft Methow Basin Plan that addressed irrigation issues in the Methow Basin.
- 1996 - The Montgomery Water Group completed a Water Supply Facility Plan for WDOE and the MVID, which assessed the overall state of the system and quantified the amount of water being used at that time. The plan suggested alternative water conservation strategies to benefit fish, improve system efficiency, and continue water provisions for irrigation. The plan included a recommendation for a pressurized closed-pipe system to convey water to the users.

1.3.2 BPA's Involvement and Subsequent Events

BPA became involved with the MVID project in 1996, after the Council recommended that BPA provide funding at that time. WDOE and the Washington Department of Fish and Wildlife (WDFW) were also to contribute funds for the MVID Rehabilitation Project based on a proposal by the Yakama Nation and the MVID. The proposed action at the time was to implement the recommendation from the Water Supply Facility Plan, which included conversion to groundwater wells and a pressurized closed-pipe system. BPA participated in extensive scoping and discussions on the project at that time, and in 1997 completed a Final Environmental Assessment (DOE/EA-1181) that evaluated a range of alternatives to rehabilitate MVID's irrigation program (BPA, 1997b). A Finding of No Significant Impact (FONSI) was issued in 1997 for two of the alternatives: 1) The proposed action (Alternative A), which included removal of the instream diversions and fish screens and replacing them with groundwater wells and pressurized pipe placed in the existing canals; and 2) Dissolution of the MVID (Alternative C).

Shortly before the EA and FONSI were completed, a group of MVID members opposed to the improvements filed suit against the MVID directors, but progress in implementing the proposed action continued. However, in 2000, the MVID Board voted for the exclusion of lands in the district as contemplated under the proposed action in the 1997 EA (Jolley et al., 2000). After the exclusion, the directorship changed and the new Board withdrew from the proposed plan. Several years of negotiations between the MVID, BPA, WDOE, the Yakama Nation, NOAA Fisheries, and others ensued. Also in 2000, the MVID voted not to accept the pressurized pipe system (alternative A in the 1997 EA) because of the following reasons (Jolley et al. 2000):

- high O&M costs;
- no assurance that legal rights-of-way for a pipeline system were secured;
- no final plan provided for evaluation and peer review;
- pump tests appeared inadequate to supply water to meet user's needs;
- no guarantee for funding;
- concerns about insufficient water rights from DOE; and
- concern for impacts to habitat fed by leaking canals.

On July 19, 2000, NOAA Fisheries sued the MVID. NOAA Fisheries claimed that the MVID's water diversion activities on the Methow and Twisp rivers constituted a "taking" of endangered Upper Columbia spring Chinook salmon and endangered Upper Columbia steelhead, which violated Section 9 of the ESA. NOAA Fisheries also sought to permanently enjoin MVID from operating its diversions until measures were implemented to avoid the repeated incidental taking of these species or until the MVID obtained a Section 10 permit allowing such takings. The parties ultimately entered into a court-approved consent decree that provided that if the MVID did not eliminate surface water diversions, then the drum screens would have to be re-meshed to comply with the National Marine Fisheries Service' Juvenile Fish Screen Criteria to protect juvenile salmonids (NMFS, 1995 and 1996). In 2000, MVID rejected the first option (elimination of surface water diversions) in favor of an enclosed pressurized pipe system, which was BPA's original preferred alternative adopted in its 1997 FONSI and elected to pursue the replacement screen option.

At various points after 1997, BPA funded interim actions, including on-farm efficiencies and lateral pipe replacement. The irrigators excluded from the district were promised compensation by BPA as outlined in the 1997 EA, and received groundwater permits from the WDOE. To date, BPA and WDOE have spent about $900,000 for various on-farm efficiencies and irrigation improvements for the MVID, including lateral pipe replacement, pre-engineering studies, facilitation, and environmental analysis.

During the spring of 2001, BPA funded a series of facilitated discussions to revisit a proposal for MVID improvements. The participants invited to these discussions included representatives of the MVID, BPA, WDOE, WDFW, Yakama Nation, and NOAA Fisheries. The group settled on a proposal to line the East and West canals with concrete and convert the flood irrigation diversions to pump houses. Ultimately, the MVID rejected this alternative because of the anticipated high future power costs for pumping.

In April 2002, the WDOE issued an Administrative Order requiring MVID to limit its diversion of water from the Twisp and Methow Rivers to a combined maximum instantaneous rate of 53 cfs, a substantial reduction from MVID's claimed diversion rights of 102.4 cfs. In August 2003, the State of Washington Pollution Control Hearings Board (PCHB) found that WDOE's Order reducing MVID's diversions to 53 cfs did not "meaningfully address the significant inefficiencies of MVID's conveyance system," and ordered WDOE to re-examine the MVID irrigation system with the goal of issuing a supplemental order to adequately address conveyance losses (WPCHB, 2003) if funding continues to be available. The WDOE is currently performing a wastewater analysis and is expected to issue a new order by January 2004. The PCHB's order requiring the wastewater analysis suggests MVID's diversions could be reduced further.

In April 2003, the MVID requested the Council to consider a proposal for BPA to fund fish screen replacement that would address screening and passage problems. On August 15, 2003, the Council recommended that BPA provide funding for the replacement of the MVID East and West diversion screens.

The fish screen replacement proposal has been cooperatively developed by the following entities who are providing the support listed, subject to limitations of available funding and staff:

- WDFW - Providing the engineering/biological expertise to evaluate appropriate fish screens at the East and West diversion sites; would ensure that screens meet current standards and criteria for fish screening and passage; would fabricate the screens and install the devices at its own expense: $275,000.
- WDOE - Responsible for management of water rights in the state of Washington; Conducting an evaluation to determine appropriate canal flow and conveyance efficiency for the MVID; also processing the exclusions with no administrative costs.
- BOR - Providing engineering expertise and technical support for the current fish screen proposal.
- NOAA Fisheries - Providing consultation expertise in accordance with requirements of the Endangered Species Act in support of the design of the proposal so that it appropriately protects/conserves listed anadromous fish.
- U.S. Fish and Wildlife Service - Providing consultation expertise in accordance with requirements of the Endangered Species Act in support of the design of the proposal so that it appropriately protect /conserves listed wildlife and resident fish.
- MVID - Providing a commitment to allow its facilities to be upgraded, and providing the long-term operation and maintenance of the screens.
- BPA - Would provide the majority funding for this project = about $958,000 for fish screen replacement that would include all infrastructure construction and preparation for fish screen installation; also paying for exclusion of members on the lower Twisp to convert to wells; currently preparing relevant environmental evaluation.

1.4 Approach We Will Take In This Document

As previously mentioned, BPA prepared an EA in 1997 to examine rehabilitation and improved water conservation strategies for the MVID (BPA, 1997b). The 1997 EA addressed a range of alternatives that were being considered at the time for a broader project scope than the proposed fish screen action. The fish screening currently proposed by the MVID for BPA funding has considerable overlap with the alternatives examined in the 1997 EA. For example, fish screen upgrades were considered as components of alternatives B and D in that document; however, the 1997 FONSI did not cover these alternatives.

The Federal action currently proposed is the issuance of funds by BPA to replace the fish screens for the MVID. This preliminary EA provides the environmental analysis of this proposed action and two alternatives: developing a groundwater/piped irrigation system and a no action alternative. Because the current proposal was part of the larger project that BPA addressed in its 1997 EA, we will make reference to, and incorporate that 1997 EA, where applicable, so as to eliminate redundancy and streamline the current EA document. The cumulative impacts chapter (chapter 4.8) of this preliminary EA addresses future possible actions that are reasonably foreseeable concerning rehabilitation of the MVID irrigation system. These actions are speculative, conceptual, or not yet agreed upon by the parties at this time.

1.4.1 Timeline

The tentative timeline for this project is identified in Table 1.

Table 1. NEPA Timeline

Timeframe	Action
Early December, 2003	Issue preliminary EA; solicit public comments on the preliminary EA
Early February, 2004	Complete the final EA based on comments received on preliminary
Mid February, 2004	Issue final EA and Finding of No Significant Impact, or start work on an Environmental Impact Statement if applicable or appropriate
March – June, 2004	Start/complete construction (if FONSI issued)

1.5 Public Involvement

After the Council recommended that BPA fund the MVID project in the summer of 1996, extensive public involvement was conducted during preparation of the 1997 EA, including meetings, scoping, open house public gatherings, workshops, etc. (BPA, 1997).

In response to the most recent proposal by the MVID, BPA sent notification to 773 points of contact on October 7, 2003 to inform them that the Council had recommended that BPA provide funding assistance to the MVID for fish screen replacement (BPA, 2003). The 773 contacts included appropriate Tribes, landowners in the Methow Valley, MVID members, agencies, local news media, and others interested in the project. The notification also stated that BPA would prepare an environmental analysis for the proposed action and alternatives. The notification invited interested parties to request a copy of the EA for review and comment, when that document becomes available. BPA contacts were also provided.

Most recently, on October 15, 2003, BPA published a similar notice in the Methow Valley News (Twisp, Washington) and The Chronicle (Omak, Washington). These notifications contained the same information as the notification described above.

CHAPTER 2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter of the EA describes the proposed action and alternatives. Chapter 2.1 outlines the proposed action, including the planned work and timeframes. Chapter 2.1.4 lists the mitigation measures that are proposed to minimize or mitigate the potential adverse environmental impacts during project construction. Chapter 2.2 presents an alternative that would involve the reconfiguration of the irrigation system from surface water diversions to groundwater wells and pressurized pipe. Chapter 2.3 presents a brief description of the no action alternative. Chapter 2.4 discusses the alternatives considered but not evaluated in detail in this EA. Lastly, chapter 2.5 compares the predicted performance of the proposed action with the no action alternative and describes how well each meets those project purposes.

2.1 Proposed Action (Fish Screen Replacement)

2.1.1 Overview

The principle components of the fish screen replacement project are listed in Table 2, and the actions are further described and explained in detail in the Pre Design Memoranda for both sites (B0R, 2003a and BOR, 2003b). Appendices A and B provide site plans, layouts, and other associated details on the proposed East and West fish screen replacements. Appendices C and D describe the contingency plan for temporary water delivery that would be provided to the East and West irrigators in the event construction is not completed by the start of the irrigation season.

Designs of the proposed fish screens are consistent with the NOAA Fisheries' Juvenile Screen Criteria (NMFS, 1995 and 1996). Passage would be designed in accordance with the NOAA Fisheries Anadromous Salmonid Passage Facility Guidelines and Criteria (NOAA Fisheries, 2003a). The primary design criteria address appropriate screen location and orientation; approach velocity; minimum screen area; sweeping velocity; flow distribution; mesh size, shape and type of material; and cleaning features.

The proposed work includes staging of equipment and materials, removing the existing concrete and metalwork from each existing screen structure, constructing the concrete infrastructures to accept the screens, and installing the fish screens fabricated by the Washington Department of Fish and Wildlife (WDFW). The entire project is planned to be completed within an eight week period.

During demolition and construction, the work sites would be isolated from normal river flows by the construction of cofferdam structures to:

- enable dry working conditions for the removal and replacement of the fish screens,
- prevent adverse affects on surface waters and water quality, and
- prevent construction impacts directly on fish that might be in the project area during the construction phase.

The contractor would complete as much of the proposed work as possible at both sites prior to the 2004 irrigation season (May 1 – Oct. 1). However, due to the uncertainties of weather and working conditions in the Methow basin in the spring, the new fish screens most likely would not be completed and in full operation by the start of the irrigation season. Therefore, a contingency plan has been developed to ensure water is provided to the irrigators on an interim basis, until

Table 2. Principle Components of the Proposed Action

MVID EAST FISH SCREEN - Replace existing drum screens with traveling belt screen	**MVID WEST FISH SCREEN** - Replace existing drum screens with upgraded drum screens
Clearing and grubbing	Clearing and grubbing
Demolition, removal and disposal of the existing screen structure	Demolition, removal and disposal of the existing screen structure
Diversion and care of the canal	Diversion and care of the canal and bypass flows
Installation of coffer dams	Installation of coffer dams
Earthwork for concrete structure for four traveling belt fish screens and a fish return pipe outlet	Earthwork for concrete fish screen structure and reinforced concrete fish ladder/spillway
Placing reinforced concrete and metal work for fish screens	Placing reinforced concrete and misc. material for fish screens and fish ladder/spillway
Installing slide gates	Installing three slide gates
Installing complete electrical system	Installing complete electrical system
Installing fish return pipe	Installing fish return pipe
	Canal reshaping
Site grading	Site grading
Placing gravel surfacing	Placing gravel surfacing
Placing riprap	Placing riprap
	Construction of log control weirs
Installing chain link fencing	Installing chain link fencing
Coordinating screen installation and other miscellaneous metalwork with WDFW	Coordinating screen installation and other miscellaneous metalwork with WDFW
Site rehabilitation with native vegetation	Site rehabilitation with native vegetation

the new screens are fully operational. Screened temporary gravity-fed pipes would bypass water around the two construction sites until construction is completed. Appropriate fish bypass has also been incorporated into the screen designs at each site and is described below.

The estimated BPA funding to complete the infrastructure construction in preparation for the screens is about $958,000. This includes all site preparation, engineering design, coffer dam construction, moving and backfilling of earthen materials, establishing the electrical service to each site, construction of new permanent fish bypasses, construction of temporary water bypasses, and so on. The fish screens are being fabricated by the WDFW at the estimated cost of $275,000. No additional funding sources for project construction are currently offered or available to meet the project purpose and need.

2.1.2 East Diversion Site (Methow River)

Replacement Screens – The replacement screens would be located approximately 60 feet downgradient in the canal from the existing headworks. No changes are planned to be made to the headworks structure, although the supporting concrete walls would likely be reinforced. The new screen facility would consist of four 6-foot wide by 7.5-foot high rotating belt type screens that would be angled 20 degrees from the canal flow to maintain the required sweeping velocity along the screens. The operational limit of the diversion is 24 cfs, based on WDOE Order DE 02WRCR-3950, but the screens can operate at flows ranging from 1 to 30 cfs and remain within the required maximum approach velocity of 0.4 feet per second. Three 36-inch wide metal

check gates would be located 10 feet downstream from the screens to control the water surface elevation on the screens. The unlined section of canal between the headworks and the screens would be replaced with a concrete channel to provide a more efficient water conduit to the fish bypass. A metal trash rack and walkway would be installed upstream of the replacement screens.

Fish Return Bypass - The new fish return bypass flow would be controlled by an adjustable overflow weir and ramp. The fish return water would flow over the adjustable weir into a concrete box and then into a 24-inch diameter, 210-foot-long buried fish return pipe. The pipe exits into the Methow River approximately 270 feet downstream from the existing diversion dam crest. The elevation of the outlet end of the pipe would be submerged at all river levels except the very lowest flows. A small concrete structure would be constructed at the outlet end of the pipe to protect and stabilize the outfall.

Cofferdams - All demolition work and construction of permanent facilities would be performed in the dry by the use of two temporary coffer dams in the construction area. One coffer dam, approximately 2 cubic yards in size, would be placed just downstream of the existing headgate to control any leakage and prevent water from entering the screen replacement construction site. A second cofferdam, estimated at 7 feet high by 25 feet wide and about 800 cubic yards, would be required to dewater the fish return outlet structure area in the Methow River. Any fish stranded in the dewatered area would be rescued at the time of dewatering and placed back in the stream. Both cofferdams would be constructed with clean native cobble fill, and would be removed after construction is completed and the new screens are installed.

Electrical Service - Electrical service to the screen site would be installed by Okanogan County Electric Co-op. The Co-op would provide and install approximately 600 feet of cable, set a padmount transformer adjacent to or just inside the fenced yard of the screen site, and install a 100 amp meter just inside the fenced yard. For electrical service to the screen site the contractor would excavate a 3 foot deep, 600 foot-long trench along or adjacent to the canal road, install electrical conduit, and backfill the trench. The contractor would also furnish and install the meter base and the secondary electrical system at the fish screens.

Access - Access to the East screen site is from the Twisp-Winthrop road approximately 5 miles north of Twisp, Washington via an existing gravel access road. The primary staging area for the contractor would be from the west side of the canal to the top of the east bank of the river, and from the headworks downstream for approximately 200 feet.

Demolition Work – As stated earlier, all demolition work would be performed in the dry. The existing concrete and other structures would be removed and disposed of by the contractor. After demolition is completed, the foundation for the new structure would be excavated and suitable material stockpiled for backfill. Material unsuitable for backfill would be disposed off-site in an approved upland location by the contractor.

Concrete for the structure including reinforcing steel and embeds would then be formed and placed. When the concrete has been cured to design strength, backfill from a commercial source or suitable backfill from excavation would be placed and compacted around the screen structure. Appropriate insulating, tenting, heating concrete and earthwork would be required during subfreezing weather.

Fencing – A permanent 6 feet-high chain link fence would be constructed around the main portion of the new fish screen and associated structures following site construction for security purposes. The fence would enclose an area about 1/3 acre.

Screen Installation - The screens and miscellaneous metalwork would be fabricated by the WDFW Screen Shop in Yakima, Washington, and installed by them immediately following the completion of concrete and infrastructure work. The construction contractor would coordinate the completed installation of electrical service and controls for the screens with WDFW. The existing diversion dam, fish ladder, and headgate structures would be left in place.

Temporary Irrigation Water Bypass - In the event that completion of the replacement screens does not appear likely by the start of the 2004 irrigation season, a temporary gravity bypass pipeline would be installed to convey water from the concrete headwall next to the headgate, around the construction site, and back into the canal below the new screen site. Thus, water would be provided to the irrigators during construction of the replacement screens. The 36-inch-diameter, 200 foot-long pipeline, along with a 42-inch control gate at the headwall, would be buried to allow gravity flow to enter the canal for the irrigators but bypass the construction area, until the replacement screens would be constructed. Appendix C provides a more descriptive explanation of this temporary water pipeline.

Site Restoration - The Contractor would perform grading and gravel surfacing, and install the fencing when earthwork is complete and weather permits in late spring or summer 2004. When contract site work is finished the contractor would clean up disturbed areas and demobilize. The site would be revegetated with native vegetation. All construction activities are planned to be completed by July 2004.

2.1.3 West Diversion Site (Twisp River)

Replacement Screens - The replacement screens would be located about 30 feet downgradient in the canal from the existing screen. The new screen facility would consist of three 4-foot diameter, 10-foot long rotating drum screens that will be angled 22.5 degrees from the canal centerline to maintain adequate sweeping velocity along the screens. The operational limit of the diversion is 29 cfs, based on WDOE Order DE 02WRCR-3950, but the design flows for the replacement screens would range from 15 cfs to 30 cfs at an approach velocity of 0.4 feet per second.

A canal overflow (spillway) weir crest would also be provided adjacent to the bypass weir. The spillway would have a 24-foot long overflow crest and would limit canal water surface to 0.85-inch screen diameter. An inclined trash rack would be placed upstream of the screens. Three new sluice gates would be placed downstream of the screens to control canal flow and maintain normal screen submergence of the 0.75-inch screen diameter.

Fish Screen Return Bypass - The fish screen bypass flow would be controlled by an adjustable ramp weir. The bypass flow would plunge into a series of constructed concrete pools with 1 foot drops to allow for upstream adult passage. The flow exits from the last plunge pool into the natural bypass channel that empties back into the Twisp River about 1/4 mile downstream. During construction, a cofferdam would be constructed around the existing weir to allow upgrades to be made to the entrance of the natural fish bypass channel.

Cofferdams – Three temporary cofferdams would be constructed to isolate the construction area from river water. A cofferdam would be constructed upstream and downstream of the existing fish screen, and the third cofferdam would be positioned in the natural bypass channel just below the last concrete pool. Approximately 13 cubic yards of fill material would form each cofferdam, for a total of about 40 cubic yards. The cofferdams would be constructed with clean native fill cobble and any fish stranded in the dewatered area would be rescued at the time of dewatering and placed back in the stream. The cofferdams would be removed after construction is completed and the new screens are installed.

Temporary Fish Bypass – During construction, off-season canal and bypass fish flows would be diverted around the construction work site by a temporary pipeline and temporary cofferdams. A 24-inch-diameter, 95-foot long fish bypass pipe would be buried across the canal embankment to discharge into the existing fish channel. This activity would be located about 300 feet distance from the Twisp River. When the cofferdam, bypass pipe and dewatering systems are constructed and functioning, screen demolition and replacement work would proceed. No sediment will be added to the Twisp River.

Electrical Service – The Okanogan Public Utility District (PUD) would install electrical service. The PUD would install about 1,480 feet of cable, set a padmount transformer, vault and poly pad, and install a 200 amp meter. The contractor would install about 1,480 feet of conduit for the cable into a 3 feet deep trench and backfill.

Access - Access to the screen site is from Poorman Creek Road near Twisp, Washington on an existing gravel access road. The staging area for the contractor would be 100 feet downstream of the canal from the screen site in a parking area along the access road.

Demolition Work - All demolition work and construction of permanent facilities would be performed in the dry. Existing concrete structure and features would be removed and disposed by the contractor. After demolition is completed the new structure would be excavated and suitable material stockpiled for backfill. Cobbles unsuitable for backfill would need to be disposed off site.

The concrete slab, walls, and fish screen piers would then be formed and placed. When the concrete has been cured to design strength, backfill from a commercial source or suitable backfill from excavation would be placed and compacted around screen structure. Appropriate insulating, tenting, heating concrete and earthwork would be required during subfreezing weather.

Fencing – A permanent 6 feet-high chain link fence would be constructed around the main portion of the new fish screen and appurtenances following site construction for security purposes. The fence would enclose an area less than 1/3 acre.

Screen Installation - The new screens and miscellaneous metalwork (ramp weir, sluice gates, walkways, handrails, etc.) would be fabricated by the WDFW Screen Shop in Yakima, Washington, and installed by them immediately after completion of the concrete and infrastructure work. The construction contractor would coordinate the completed installation of electrical service and controls of the screens with WDFW.

Temporary Irrigation Water Bypass - In the event that completion of the replacement screens does not appear likely by the start of the 2004 irrigation season, a temporary gravity bypass pipeline would be installed to convey water around the construction site and back into the canal below the new screen structure, thus providing water to the irrigators during construction of the new screens. The 36-inch-diameter, 200-foot-long pipeline, along with a stoplog flow control structure, would be buried to allow gravity flow to route around the screen site and reenter the canal for the irrigators. Appendix D provides a more descriptive explanation of this temporary water pipeline.

Site Restoration - The Contractor would perform grading and gravel surfacing, and install the fencing when earthwork is complete and weather permits in late spring or summer 2004. When contract site work is finished the contractor would clean up disturbed areas and demobilize. The site would be revegetated with native vegetation. All construction activities are planned to be completed by July 2004.

2.1.4 Mitigation Measures

The following measures would be incorporated into the proposed project to eliminate or reduce potential adverse environmental effects associated with construction of the new fish screens.

- The screens themselves would be mitigation for the ongoing impacts of the old screens. They are designed to protect and conserve fish by adhering to current Federal and state fish protection standards and criteria for screening and passage.

- The project would be constructed in the dry to: 1. prevent direct construction impacts to fish that could cause injury or mortality, 2. enable dry working conditions during removal of existing screens and construction of new screens, and 3. prevent adverse affects to surface waters and water quality.

- Clean cobble fill would be used to construct the cofferdams.

- Fish salvage efforts would be employed as needed during the dewatering (coffering) of the screen sites in preparation of screen replacement.

- Turbid water from dewatering would be discharged into settling and infiltration basins or the canal downstream of the screens before it is allowed to re-enter the river. No sediment would be added to the Methow or Twisp rivers.

- A Pollution and Erosion Control Plan that incorporates best management practices for erosion control and a hazardous spill response plan would be prepared and implemented to prevent pollution from construction activities.

- Equipment would be stored away from the river and monitored for any leakage of hydraulic fluids, gasoline, and oil during construction.

- Care would be exercised to restrict the number of trees that would need to be removed or disturbed at the project sites. The bypass pipes would be routed to disturb as little established vegetation as possible during construction.

- Following construction, the sites would be graded and planted with native vegetation to help stabilize the soil and mitigate for the removal of vegetation.

2.2 Alternative 1 - Groundwater Well/Pressurized Pipe Irrigation

The Okanogan Wilderness League (OWL) has suggested that this EA address an alternative that includes the "elimination of the canals in favor of a pressurized pipe system and full conversion from surface water diversions to groundwater withdrawals" (Earthjustice, 2003). This initiative is also supported in OWL's letters going back to the late 1980s (OWL, 2003; OWL, 1993; OWL, 1991; OWL, 1989; Bernheisel, 2003). The OWL alternative would be very similar to BPA's preferred alternative (Alternative A) in the 1997 EA, where it was addressed in detail. The environmental impacts of this alternative were found not to be significant in BPA's FONSI. As we've stated in chapter 1.3.2., the MVID rejected this alternative in 2000.

Based on the plans developed for the 1997 EA, this alternative would entail the following:

- A new irrigation system would be built. It would use 18-inch groundwater wells in three separate well fields, one for the east canal and two for the west canal. About 13 miles of new low-pressure pipe would be placed in existing canal rights-of-way.

- Three small concrete tanks would be built above ground to act as reservoirs for the new system. Each tank would be about 20 feet tall by 20 feet in diameter.

- Several existing canal reaches would be abandoned: east canal reaches 1, 2, lower 4, 5, and 6; west canal reach 1 and middle of reach 3. (West reach 5 had already been abandoned prior to the 1997 EA.) Irrigated lands served by these canal reaches were removed from the MVID under the April 2000 MVID Board resolution (00-07), and are now served by existing or new, privately owned groundwater irrigation wells. Figure 2-2 of the 1997 EA delineates location of the reaches.

- A portion of reach 2 on the east canal has been shared under an agreement with the Barkley Ditch users for many years. In order not to adversely affect the Barkley Ditch users, this portion of the reach would be replaced with a pipeline to provide them with the same amount of water they are currently using, and turned over to them.

- The total estimated cost for this alternative in the 1997 EA was $4.6 million (currently $5.24 million); $1.3 million (currently $1.48 million) of this amount was the estimated cost of reimbursing members who would be excluded from the MVID. The total construction cost was estimated to be $3.3 million in 1997 (currently $3.76 million). Funding sources have not been identified for this alternative. If BPA funding recommended for the proposed fish screening alternative were applied to this alternative, there would still be a substantial funding gap, estimated at between $3.9 million and $4.1 million. Cost estimates developed in 1997 have been projected into current year dollars based on a calculated average Consumer Price Index.

- An estimated 2 year period of time could be required to complete all phases of planning and construction for this alternative, providing that funding sources were secured.

- MVID members who were excluded from the District under the 2000 MVID Board resolution were to keep their benefits under MVID water rights and claims, by having MVID rights changed to independent wells. WDOE is in the process of granting the former MVID members authorization to transfer their portions of the existing MVID surface water points-of-diversion to points-of-withdrawal for existing or new groundwater wells. WDOE would also need to grant the remaining MVID members a similar change in water rights from surface to groundwater.

If this alternative is selected, the actions from a Mitigation Action Plan (Appendix I in the 1997 EA) would still apply. Such measures would be implemented to eliminated and/or minimize potential environmental adverse effects.

2.3 Alternative 2 - No Action

Under the no action alternative for the MVID diversion screen replacement project, BPA would not fund the replacement of the fish screens at the East and West irrigation diversions. Under the NOAA Fisheries consent decree, the MVID would either need to find alternative financing for replacing the screens or not operate the irrigation system. This could result in either increased costs to the irrigators for alternative financing, and/or at least temporarily ceasing the delivery of irrigation water to the irrigators' fields. Construction and installation of the new fish screens would most likely be delayed or not occur.

2.4 Alternatives Considered But Not Examined in Detail

Two other alternatives that could attain the broader project purposes of the MVID rehabilitation project were considered in the 1997 EA (please see BPA (1997b) for a more detailed narrative description of those alternatives). These alternatives included Alternative B, Partial upgrade to the existing irrigation system, and Alternative C, Dissolution of the MVID. Alternative B included upgrading the fish screens, along with rebuilding the remaining open canal sections. Alternative C contemplated a total dissolution of the MVID, with members changing to individual wells (or small local irrigation districts in a few cases) to serve their irrigation needs.

Alternative B was estimated at $11.9 million to implement in 1997 (currently $13.57 million) along with an estimated annual O&M cost of $127,000 (currently $144, 907), and individual well drilling costs by the members who would leave the MVID. Alternative C was estimated at a cost of $2.7 million (currently $3.08 million) to implement with no annual O&M costs to the MVID. All costs would be shifted to the individuals.

These alternatives were not brought forward for detailed consideration in this preliminary EA. Alternative B addresses a broader scope of action than the need and purposes identified for the proposed action in this preliminary EA, goes far beyond the recommended funding authorization by the Council, and would be considerably more expensive to implement. Alternative C was rejected by the MVID Board as a viable alternative.

2.5 Comparison of Alternatives Relative to Predicted Performance

Table 3 presents a comparison of the alternatives. Each is evaluated as it meets the purposes for the project, which are listed in chapter 1.2.

Table 3. Predicted Performance Summary of the Proposed Action and Alternatives

	Proposed Action - Fish Screen Replacement	**Alternative 1 - Conversion to groundwater wells and pressurized pipe**	**Alternative 2 - No action alternative**
Prevent losses of anadromous and resident fish to the MVID irrigation system	Screens would be designed to meet current NOAA Fisheries criteria to prevent losses of all life stages of fish.	Would eliminate losses entirely by replacing diversions and screens with groundwater wells.	Current documented fish losses would continue unless diversion is halted.
Improve fish passage	Fish bypass improvements would provide safe passage of fish through the system; Fish passage problems with diversions would remain.	Would eliminate need for diversions on Twisp and Methow Rivers that are obstacles to fish passage; would eliminate need to upgrade existing fish screens and eliminate current fish screen and diversion passage problems.	Diversions and fish screen bypasses would remain as fish passage obstacles.
Assure MVID members continued access to adequate water supplies	No change from the current access; screens would be designed to operate within a wide range of flows. Possible need for diversion or canal repairs to meet pending WDOE order limiting diversions due to wasteful water practices.	Would provide access to adequate water supplies for all MVID members in accordance with WDOE order.	Could result in at least temporary disruption of water supplies for MVID members due to enforcement of consent decree and WDOE order.
Achieve cost and administrative efficiency [1]	Estimated implementation and material cost of about $958,000 for infrastructure (Federal funds) and $275,000 for the actual screens (state funds). Est. annual O&M costs: $129,000 [2] Additional costs may be incurred to comply with WDOE order.	Estimated implementation cost of $3.76 million. Most likely no additional funding would be needed to comply with WDOE order. Est. annual O&M costs: $119,000	Costs unknown. Alternative funding would be needed to comply with consent decree and WDOE order or irrigation would be halted. Could result in loss of crops, including orchards. Est. annual 0&M costs: $118,000, but likely to raise due to increased repairs and maintenance

Compliance with Laws, Regulations, and Executive Orders	Would comply with current fish screening and passage standards; would also comply with ESA, NHPA, CWA, etc.; Ability of existing canals to function in compliance with pending WDOE order unknown.	Would be in compliance once implemented, but in violation of consent decree until funding secured and construction completed, which could take several more years; Most likely would be in compliance with WDOE order.	Would result in MVID violation of consent decree/Endangered Species Act and WDOE order unless irrigation is halted.

[1] Cost estimates, originally developed in the 1997 EA, have been projected into current year dollars based on a calculated average Consumer Price Index (CPI) from 1997 to the present. These estimates are relatively conservative when compared to other methodologies.

[2] Cost estimate = $117,000 normal MVID O&M, plus $12,000 for MVID subcontract with WDFW for screen reviews and maintenance.

CHAPTER 3 AFFECTED ENVIRONMENT

3.1. General Overview

As part of the 2000 amendments to the Fish and Wildlife Program of the Northwest Power Planning Council, the revised Program adopted an ecosystem-based subbasin approach for fish and wildlife management. This approach addresses biological objectives and action strategies for each province and subbasin within the Columbia River basin. Accordingly, a Methow Subbasin Summary was prepared to identify and catalogue existing information and activities to help make informed choices on fish and wildlife mitigation and restoration (WDFW, 2001). We make reference to this document and the 1997 EA for the resource baseline in this preliminary EA. However, we will summarize only the key and relevant points in this chapter.

The MVID is located in the Methow Subbasin of the Okanogan Highland physiographic province in north central Washington State. The subbasin is entirely within Okanogan County and includes the towns of Twisp, Winthrop, Methow, Pateros, and Carlton. The Methow River Valley drains approximately 1,772 square miles of the eastern slopes of the Cascade Range and joins with the Columbia River at Pateros, Washington. The Twisp River is a primary tributary to the Methow River; their confluence is at the town of Twisp.

The MVID irrigation system and associated lands are shown in Figure 1. The legal descriptions of the East and West screen sites are as follows:

Project Location	River	Legal Description
East Diversion screen site	Methow River	T.34N, R.22E, Sec. 30, SW1/4, NW1/4
West Diversion screen site	Twisp River	T.33N, R.21E, Sec. 10, SW1/4, SE1/4

The current total irrigated acreage within the borders of the irrigation district is estimated at about 880 acres, after the 2000 exclusion. Most of the current irrigation is for hay, alfalfa, lawn watering, and limited apple orchards. The water is applied by sprinkler systems pumping directly from the canals, ditches and/or lateral pipes supplied from turnout structures.

The MVID canal system is comprised of two main gravity-fed, open unlined canals. The East diversion canal is a 15-mile long canal that diverts water from the Methow River. Water diverted from the Methow River supplies the east side of the valley between the towns of Twisp and Carlton. Flow is diverted at the east diversion site by the use of a timber flashboard dam that extends across the width of the river. The dam creates about 3 feet of head when all boards are in place. Water passes two 48-inch by 22.8-inch headgates through about 45 feet of diversion canal, which is constructed from an earthen slope on the left side and a concrete retaining wall on the right. There are two existing 4.6-feet-diameter drum screens oriented perpendicular to the canal flow. The drums rotate by means of 10-feet-long paddle wheels. The U.S. Bureau of Reclamation (2003a) provides more detailed description of the existing structures on the east diversion, as well as current operation.

The West diversion canal is a 12.5-mile long canal that diverts water from the Twisp River. Water diverted from the Twisp supplies the west side of the valley between the towns of Twisp and Carlton. The West diversion requires a rock push up dam to be constructed with a bulldozer or other large equipment in the main channel of the river annually to capture water from the Twisp River into the canal, particularly during low flow periods. The MVID has also

found it necessary to place rocks and boards in the river to ensure sufficient water is diverted during low flow periods to make reliable irrigation deliveries.

The flows diverted into the west canal pass through a sluice headgate structure and then through an approximately 400 feet long diversion canal to two 7.25 feet-diameter paddle-wheel fish screens oriented perpendicular to the direction of flow. For fish that may enter the canal, a weir next to the fish screens provides fish bypass flows to a 400-yard-long natural side channel that discharges fish back into the river. A minimum flow of 5 cfs is always maintained through the fish bypass channel regardless of the operation of the diversion. The U.S. Bureau of Reclamation (2003b) provides more detailed description of the existing structures on the west diversion, as well as current operation.

3.2 Water Resources

Ice Age glaciation greatly influenced the water resources of the Methow Valley. The glaciers originally carved U-shaped valleys into the mountains' basalt core. As the continental ice sheet that once covered the area receded, however, deposits of glacial till and outwash filled the valleys, providing a broad, shallow alluvial aquifer. This aquifer is very permeable, allowing water to flow down the valley both underground as groundwater and in the rivers and streams as surface water. Under these conditions, the groundwater in the shallow alluvial aquifer and the surface water in the rivers and streams are described as being in hydraulic continuity with each other. The sediments of glacial till and outwash have since been reworked along major streams and tributaries resulting in coarsely textured and permeable soils. Most soils are gravelly sandy loams or stony fine sandy loams.

3.2.1 Surface Water

The Draft Methow River Basin Plan states that water quality in the Methow basin is affected by the discharge of municipal wastewater treatment systems, logging, grazing, land clearing, and road-building (Methow Valley Water Pilot Planning Project Planning Committee, 1994). Both rivers are found on the 303(d) list, which identifies streams that are priorities for development of Total Maximum Daily Load [TMDL] standards. Both rivers are listed as in-stream flow- and temperature-limited, which means they do not meet the water quality standards under the Clean Water Act. However the Methow River, within the project area, is classified by the State as Class A water quality (excellent), and the Twisp River above Twisp is classified as AA (extraordinary).

As stated earlier, surface waters from the Methow and Twisp Rivers are diverted to supply the east and west sides of the Methow Valley, respectively. The MVID Water Supply Facility Plan (MWG, 1996) indicates that the MVID diversion points are capable of diverting enough water from these rivers to supply the MVID with its historic mean diversion rate of about 66.8 cfs.

The east canal has historically diverted an average of about 41 cfs from the Methow River although diversions have decreased to 15-24 cfs in the past three years as a result of the consent decree agreement restricting diversions based on river flows and appropriate velocities. Historically, September irrigation diversions are the highest however the consent decree has altered this situation. The average historic September east canal diversion of 39.3 cfs was about 13 percent of the mean September flow in the Methow River at that point.

The West canal has historically diverted an average of about 26 cfs of water from the Twisp River (MWG, 1996) although, like the situation on the East canal, flows have recently been restricted between 24 and 15 cfs by the consent decree. The West canal rejoins the Methow River at RM 28.9, upstream of Carlton. The point at which the west canal diverts water is about 2.3 miles upstream of the USGS gauging station located at RM 1.6 on the Twisp River. The mean river flow at the gauging station during the month of September is 54 cfs. The average historic September diversion amount of 24.6 cfs is approximately 46 percent of the mean September flow in the Twisp River at that point. Although surface water diversions provided enough water, substantial portions of the MVID, particularly the lower stretches, did not receive dependable water supplies because the MVID conveyance and distribution facilities were inefficient and not sufficiently maintained. Many of these underserved areas were excluded from the MVID under the 2000 exclusion. With present diversions limited, some users are still underserved even after these exclusions. To remedy this situation, MVID is undertaking a canal management planning process using data and engineering obtained from previous BPA funding, that identified canal inefficiencies and proposed solutions such as lining, piping, and reshaping to match deliveries to available water supplies.

3.2.2 Groundwater

Groundwater in the Methow Valley is recharged principally from rain, snowmelt, and stream run-off into the shallow alluvial aquifer that underlies the valley. Groundwater levels are also affected as surface water is applied to fields and percolates back into the aquifer, and as the existing canal systems leak water back into the aquifer. Because the majority of the groundwater is heavily influenced by surface sources and is in continuity with the river, the chemical character of the groundwater in the Methow subbasin can probably best be characterized by the surface water quality in the Methow River.

Although the MVID delivers surface water for irrigation, some individual landowners use groundwater from privately owned wells for domestic use and/or irrigation to preliminary or replace water deliveries from the MVID. The total number of such wells, and the amount of irrigation water they supply is unknown. However, it appears that more than 200 recorded domestic and irrigation wells exist in the MVID service area. The irrigation wells (about 23 of the 200 documented wells) are concentrated near the lower reaches of the east and west canals (MWG,1996).

A recent U.S. Geological Survey study focused on the hydrogeology of unconsolidated sedimentary deposits, water quality, and exchanges between the surface and ground waters in the Methow Basin (Konrad et al., 2003). One of the study's conclusions was that groundwater and surface water sampled in 2001 were generally of high quality. The study also showed that groundwater discharge from unconsolidated sedimentary deposits in the Methow River Basin is a primary source of baseflow in the Methow and Twisp rivers. Conversely, unconsolidated aquifers are recharged by infiltration of snowmelt and rainfall, groundwater flow from nearby aquifers, and seepage from rivers and irrigation canals. The study also concluded that seepage from about 73 miles of unlined irrigation canals (including the MVID canals, among others) within the Subbasin recharges the aquifer in the late spring and summer. This seepage is returned to the rivers downstream of the diversions and most likely results in a transient increase in instream flows during late summer and early fall. The amount of streamflow increase due to the unlined MVID canals is unknown. During later summer, while irrigation demand is still high, this recharge does not offset the MVID diversions, however it does in the

fall as diversions are reduced and eventually cease. The recharge from irrigation drops to almost zero by February.

3.3 Soils

Ice glaciation greatly influenced the water resources in the Methow Valley. The glaciers originally carved U-shaped valleys into the mountains' basalt. As the continental ice sheet receded, deposits of glacial till and outwash filled the valleys, providing a broad, shallow alluvial aquifer. This aquifer is very permeable allowing water to flow both underground and groundwater, and in rivers and streams as surface water. The sediments of glacial till and outwash have since been reworked along major streams and tributaries resulting in coarsely textured and permeable soils. Konrad et al. (2003) further discusses the geology and hydrogeologic interpretation for the Methow Basin. Most soils are gravelly sandy loams or stony fine sandy loams.

3.4 Vegetation

The Okanogan Highlands Province is characterized by moderate slopes, broad rounded summits, and broad river valleys (Franklin and Dyrness, 1988), and the primary natural plant community consists of high desert steppe. This association is characterized by bunchgrasses and threetip sagebrush. The steppe is arid to semiarid, with low precipitation, warm-to-hot summers, and relatively cold winters.

The project landscape is confined to the valley bottoms, and lies adjacent to the Methow and Twisp Rivers. The Methow Valley is predominantly agricultural bottomland and upland steppe. Most of the valley bottom vegetation communities are croplands that grow hay, alfalfa, wheat, peas or orchards. Steppe communities are located upslope of the existing canals where native vegetation is relatively undisturbed. Dominant vegetation along the canals consists of both species that are drought-tolerant and those that tolerate both moist and dry conditions. The general habitat at the East diversion and fish screen site shows evidence of past disturbance. Small rocks and bare ground without vegetation represent an estimated 35 percent of the surface. The West diversion and fish screen site is well vegetated along the canal banks and in the immediate vicinity of the existing screens. Some plant species observed during an October 28, 2003 site visit included the following:

East Site		**West Site**	
Red alder	Box elder	Willow sp.	Mannagrass
Bitterbrush	Phacelia sp.	Snowberry	Horsetail
Horsetail	Bulbous bluegrass	Birch (dark)	Orchardgrass
Mannagrass	Calamagrostis sp	Goldenrod	Rose sp.
		Bitterbrush	Bentgrass

Riparian zones are areas that are located adjacent to aquatic systems with flowing water and that contain elements of both aquatic and terrestrial ecosystems that mutually influence each other. Some portions of the canals resemble true riparian characteristics because water is contained within them during the irrigation season and other parts of the year, as well. A 1996 survey of riparian vegetation along the canals conducted for the MVID Water Supply Facility Plan identified hydrophytic, facultative, and drought-tolerant species (Parametrix, 1995, in MWG, 1996). Most of the riparian areas within or next to the canals contain relatively low species richness and a predictable list of species.

A review of the National Wetland Inventory quadrangle maps shows wetland classifications in the general project vicinity, particularly associated with the Twisp or Methow Rivers or its floodplains (Table 4). Naturally occurring wetlands may be found in the project area associated with stream margins, floodplains, and natural seeps. Some areas along the canal, where leaking canal water supports water-dependent vegetation, may also be recognized as wetlands. However, these areas were examined by both Parametrix in 1995 and by wetland experts from the U.S. Army Corps of Engineers in 1997 and were found not to have the characteristics that define a wetland, except for the vicinity of the west canal, intake, and screens. These characteristics are a combination of soils, hydrology, and vegetation factors.

Table 4. Wetlands in the General Vicinity of the Diversions along the Twisp and Methow Rivers [1]

EAST DIVERSION SITE	WEST DIVERSION SITE
Riverine unconsolidated shore, seasonally flooded	Riverine, upper perennial, open water, permanently flooded
Palustrine scrub shrub, seasonally flooded	Palustrine, forested, temporarily flooded
Palustrine, Forested, seasonally flooded	Palustrine, scrub Shrub, seasonally flooded
Palustrine Emergent seasonally flooded	Riverine, unconsolidated shore, seasonally flooded

[1] Classification codes follow Cowardin et al. (1979)

3.5 Fish

The Methow Basin provides about 182 miles of streams used by several anadromous fish species, including chinook, sockeye, and coho salmon and steelhead trout (Mullan et al., 1992). Little is known about sockeye and coho salmon use of the MVID project area. However, such use appears to be minimal because of the basin's location and characteristics (BPA, 1997b).

The Methow River basin is fairly high upstream in the Columbia River system. Because of its location, anadromous fish that use the basin are subjected to many impacts during their migrations up and down the Columbia River, including passage and associated mortality at nine mainstem Columbia River dams, and overharvest in downstream fisheries (WDW et al., 1990; Caldwell and Catterson, 1992). Fish are particularly affected at the Columbia River mainstem dams, as they make their way up the system to spawn and as the juveniles return to the ocean. Both rivers include designated uses for salmonid migration, rearing, spawning, and harvesting (WAC 173-201A).

Resident species that do not migrate to the ocean include rainbow, cutthroat/rainbow hybrid, brown, brook, and bull trout; and mountain whitefish. Table 5 lists the fish known to use the project area. The species of primary concern in this portion of the basin are chinook salmon (summer and spring), summer steelhead trout, and bull trout, because they are listed under the Endangered Species Act (http://www.nmfs.noaa.gov/prot_res/species/ESA_species.html and http://www.nmfs.noaa.gov/prot_res/overview/es.html and http://raysweb.net/specialplaces/pages/trout.html). Because the factors affecting fish often depend on the species' individual life histories (stages), Table 6 illustrates the life history timing of Methow and Twisp River salmonids in the project area.

- Spring Chinook

Spring Chinook spawn in the upper mainstem reaches of the Methow and Twisp rivers. The fish use both rivers in the MVID project area, mainly for passage. However, spawning surveys

Table 5. Representative Fish Species that Occur in the Methow and Twisp Rivers

Anadromous Fish	Resident Fish
Summer chinook salmon	Rainbow trout
Spring chinook salmon	Cutthroat trout
Fall chinook salmon	Eastern brook trout
Coho salmon	Bull trout
Summer steelhead trout	Brown trout
	Mountain whitefish
	Largescale sucker
	Longnose dace
	Redside shiner
	Sculpin

Source: (BPA, 1997)

Table 6. Life History Timing of Chinook, Steelhead, and Bull Trout in the Methow and Twisp Rivers

Fish Species	Adults return from Ocean	Spawning	Incubation/Emergence	Juvenile rearing	Young Migrate Downstream
Spring Chinook	May – Aug.	Sept.-Oct.	Oct.-March	Year Round	Apr.–Aug.
Summer Chinook	Aug-Oct.	Sept.-Nov.	Sept.-April	Jan.-March	Apr.-Oct.
Fall Chinook	Oct.-Nov.	Nov.	Nov.-March	Mar.-July	June
Summer Steelhead	Aug.-May	Mar.-June	June-Sept.	Year Round	Apr.-May
Bull Trout	---	Sept.-Nov.	Oct.-April	Year Round	---

Source: BPA, 1997

conducted in the basin have identified redds near the diversions on both rivers, including both above and below the Twisp diversion. Spring Chinook juveniles spend about one year rearing in freshwater before they out-migrate to the ocean.

In-basin limiting factors for spring Chinook include the following: intermittent flow in some reaches, low flows because of irrigation diversions, substandard diversion screens, winter icing, and habitat losses from development in riparian areas (WDW et al., 1990; Caldwell and Catterson, 1992). The goal in the basin is to obtain a sustainable harvest of 2,000 fish, to be shared between sport and Tribal fisheries, while maintaining genetic integrity and a balance of spawners in tributaries of the subbasin (WDW et al., 1990; Caldwell and Catterson, 1992).

■ Summer Chinook

Summer Chinook spawn in the lower- and mid-mainstem Methow River reaches up to the Chewuch River confluence (RM 50.1); this area includes the MVID project area on the Methow River. Summer Chinook are not known to spawn or rear in the Twisp River at the present time, although they have in the past. The river basin is being managed to encourage the natural production of summer Chinook according to current conditions (i.e., hatchery summer Chinook are not released into the Twisp River).

Adult summer Chinook migrate into the system beginning in late August, and spawn in late September through early November. Smolts emigrate in the spring, typically before diversions begin. Summer Chinook juveniles spend about 3 to 4 months rearing in the Methow system before out-migrating to rear in the Columbia River impoundments (D. Bambrick, Yakama Indian Nation, pers. comm., 1997).

In-basin factors limiting summer chinook production include the following: low stream flows because of irrigation diversions, and in-stream and riparian habitat losses (WDW et al., 1990). The goal in the basin is to obtain a sustainable harvest of 3,000 fish, to be shared between sport and Tribal anglers while maintaining the unique characteristics of the stock.

■ Fall Chinook

Fall chinook use a small part of the mainstem Methow River. They are not known to use any tributary streams (including the Twisp River) for spawning or rearing. Little is known about the life history of fall chinook in the Methow River, except that they migrate into the system in October, and spawn in November; smolt emigration most likely occurs in June. Documented fall chinook redds have been located only in the lower reaches of the Methow River, downstream of the MVID project area. There is currently no management plan for fall chinook in the Methow Basin because of the lack of information on their basin use.

■ Summer Steelhead

Summer steelhead are present in the Methow and Twisp rivers and in most accessible tributaries in the basin. Adults begin entering the Methow system in July, and continue their migration into the system through October. During the winter, many adults return to the Columbia River's warmer waters. Spawning occurs in the upper mainstem Methow River upstream of the MVID project area and in tributaries, including the Twisp River, beginning in March and continuing into early June. Juveniles rear near spawning areas in tributaries. However, many smolts also emigrate from smaller tributaries to rear in the warmer waters of the mainstem Twisp and Methow rivers. Hatchery releases in the Methow Basin, from Wells Dam brood stock, averaged 370,664 summer steelhead smolts per year from 1981 through 1987 (WDW et al., 1990).

The basin's steelhead management goal is to rebuild natural runs and maintain genetic integrity, while allowing a harvest of 10,000 hatchery steelhead for sport and Tribal anglers. The after-harvest escapement target is 3,200 natural fish. In-basin factors limiting summer steelhead production include the following: mortalities from winter icing, spring runoff flooding, lack of in-stream winter cover, and inefficient screen systems at diversion points.

■ Sockeye Salmon

Sockeye salmon are known to use the Methow Basin in small numbers. Sockeye that use the Methow and Twisp river systems are somewhat different from typical sockeye, in that they do not rely on lakes or reservoirs for spawning. Redds have been recorded up to Winthrop in the mainstem Methow River and also in the Twisp River (Caldwell and Catterson, 1992). There is minimal information about escapement or life-history information specific to the Methow River basin. Sockeye enter the system in September; and peak spawning occurs in late September and early October. Emergence, rearing areas, and out-migration timing are uncertain. There is currently no management plan.

■ Resident Fish

The Methow and Twisp rivers support a significant recreational fishery for rainbow, brown, and brook trout. The Twisp River drainage is the most extensively used area for recreation in the MVID project area. Rainbow trout are stocked in the Methow Basin to help support the recreational fishery. Brook trout were introduced into the Methow Basin in the early 1900s and they can interbreed and hybridize extensively. Cutthroat, bull, and brook trout appear to have similar temperature preferences, are found primarily in the cooler upper reaches of the Twisp River, and are probably not found in the MVID portion of the lower Twisp River. These trout species are also found primarily in the upper Methow River and tributaries; however, some bull trout and brook trout have been documented in the MVID portion of the Methow River. Rainbow trout are found throughout the MVID project area in the Methow and Twisp rivers. Cutthroat and rainbow trout are spring spawners (April through early May), but cutthroat trout emergence is typically later than that for rainbow trout because cutthroat prefer cooler water temperatures. Bull trout and whitefish typically spawn in the fall months, and develop over the winter months.

3.6 Wildlife

The project area wildlife is characteristic of the lower elevation fauna of the Okanogan Highlands. The U.S. Forest Service prepared a list of the terrestrial wildlife that may occur in the project area (USFS, 1997). The represented habitats for which the lists were prepared are (1) the hot-dry, lowest elevation Ponderosa forest/grassland associations, and (2) all relatively open non-forested areas including steppe, croplands, and riparian areas. Terrestrial wildlife include 309 species of amphibians, reptiles, birds, or mammals, and over 77 percent (238 species) of the total are birds; 16 percent (48 species) are mammals; and the remaining 7 percent (23 species) the combined amphibian and reptilian species. Further details about the project area wildlife may be found in BPA (1997). In addition, the Methow Subbasin Summary also provides additional information on the more common wildlife in the project areas (WDFW, 2001).

3.7 Threatened and Endangered Species

Table 7 displays the plant and animal species that are protected under the Endangered Species Act (ESA) and that could be found in Twisp and Methow rivers. The FWS has administrative responsibility for the listed terrestrial species and resident fish including bull trout, while NOAA Fisheries has responsibility for anadromous fish, such as steelhead and Chinook salmon. In accordance with the ESA, a Federal agency is required to consult with either or both of these agencies when listed species could be affected by actions they would take. In addition, the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires consultation with NOAA Fisheries on activities that may adversely affect Essential Fish Habitat (EFH). EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (PFMC, 1999). The project area is considered EFH for Chinook and coho salmon.

3.8 Cultural Resources

Information on Tribal Rights and Traditional Uses can be found in BPA (1997). In October 1996, staff from BPA's cultural resources contractor, archaeological and historical services, conducted a field investigation of the East and West canals. The possible pipeline, reservoir, and well locations for Alternative 1 were also inspected. Two artifacts were recorded. Although

Table 7. ESA-Listed Species that Could be Present in the Project Areas

Common Name	Federal Status	Critical Habitat Designated [1]	Essential Fish Habitat	Agency Jurisdiction
Spring Chinook Salmon	Endangered	February 2000	Yes	NOAA Fisheries
Summer Steelhead	Endangered	February 2000	No	NOAA Fisheries
Bull trout	Threatened	Proposed	NA	FWS
Bald eagle	Threatened	No	NA	FWS
Northern Spotted Owl	Threatened	Yes	NA	FWS
Gray Wolf	Endangered	No	NA	FWS
Grizzly Bear	Threatened	No	NA	FWS
Canada lynx	Threatened	No	NA	FWS
Ute ladies' tresses	Threatened	No	NA	FWS

NA = Not applicable.
[1] Critical habitat designations by NOAA Fisheries have been suspended and are under review. The U.S. District Court for the District of Columbia approved a National Marine Fisheries Service consent decree on April 30, 2002, withdrawing a February 2000 critical habitat designation for the salmon and steelhead species listed in this table.

five cultural resource sites have previously been identified in the vicinity of the canal, only the Chilliwist Trail is within the project area. It is also known that unmarked Native American cemeteries are located in the area, and one known cemetery has been marked with a rock (Confederated Colville Tribal member, public meeting, 1996).

In November of 2003, a BPA archaeologist surveyed the East and West fish screen replacement proposal sites, including the fish and water bypass and electrical cable trenching areas. No cultural materials were found.

The MVID canal system has been determined to be eligible for inclusion on the National Register of Historic Places (National Register), under Criterion A (property associated with events that have made a significant contribution to the broad patterns of our history). The system has been the most significant irrigation feature in the Methow Valley. Although neglect and numerous changes in the structural materials have caused substantial deterioration, both the East and West canals are still mostly located in the original right-of-way.

3.9 Socioeconomics and Land Use

The MVID is one of about 50 irrigation districts in Washington State. Irrigation districts operate under state law and their purpose is to distribute available water efficiently, equitably and fairly to all users (WDOE and Washington State University, 1995). Land uses in the project area include intensive agricultural, urban, recreational residential, tourist, commercial, and unclassified areas including forest, grazing, and dryland farming. Mining and timber-related activities occur mainly in the upper subbasin, and hay fields, pastures, cattle ranching, and fruit orchards dominate the land uses in the lower valley. Public lands of the Mount Baker-Snoqualmie and Okanogan National Forests surround the Methow Valley.

The Methow Valley local economy historically has been centered on mining and logging, supplemented by agriculture. However, more recent interests are lumber and wood products production, recreation, and tourism. Agriculture remains an important component of the local economy.

Residential development has been relatively strong in the valley with absentee owners predominating in the area, owning as much as perhaps 60 percent of the land. Property values are increasing, particularly in the northern portion of Methow Valley.

CHAPTER 4 ENVIRONMENTAL IMPACTS

This chapter describes possible impacts that would be caused by construction of the proposed action and alternatives for the project. As mentioned earlier, the proposed action addressed in the 1997 EA is similar to Alternative 1, with a few minor differences. These differences will be discussed as appropriate for the alternative. We refer the reader to Alternative A in the 1997 EA for a more elaborate explanation of anticipated impacts for Alternative 1. Table 8 provides a comparative evaluation of impacts among the alternatives.

4.1 Water Resources

4.1.1 Proposed Action– Fish Screen Replacement

Water Quantity
None of the activities proposed under this alternative are expected to affect water quantity. Operation of the new screens would not alter or affect the water quantity entering or passing through the canal systems; however, the pending WDOE Order could reduce the amount of water the MVID can legally divert. The upgraded screens are designed to operate under a range of flows that would include both the current diversion rates for the MVID and any diversion rates that may be set by the impending WDOE revised Order.

If construction of the screens is not completed and fully operational by the start of the irrigation season, the project would provide temporary irrigation water to the irrigators through a water bypass at each site, until the screens are operational. Otherwise, water is not diverted into the canals during the non-irrigation season.

Water Quality
East Canal screen work. Placement of a cofferdam below the diversion headgate would not impact water quality in the Methow River. The canal flows would be terminated and allowed to drain to the canal system before the cofferdam is installed. Turbid water that may result from placement of the cofferdam would not be allowed to pass through the existing fish bypass to the Methow River. Minor turbidity associated with cofferdam installation and removal is not expected to cause any problems.

No temporary fish bypass is needed during construction of the new East diversion screen, as the canal can be sealed off at the diversion point on the river. The existing fish bypass would be sealed to prevent flows to the Methow River. A new permanent fish bypass would be constructed that would comply with current fish passage standards (NMFS, 1995 and 1996) to return fish safely and effectively to the Methow River.

The placement of a cofferdam for construction of the fish bypass outfall in the Methow River would temporarily isolate an area about 4,200 square feet in size. This inwater work would be accomplished in less than one day. During the cofferdam placement, some localized, short-term (less than two hours) turbidity can be expected to occur in the immediate area. In addition, during removal of the cofferdam, short-term turbidity can be expected as the area is restored. The outfall will permanently impact about 1,600 square feet along the east bank of the Methow River. Both cofferdams would be composed of clean native cobble fill.

Table 8. Environmental Analysis Summary

Resource	Proposed Action – Fish Screen Replacement	Alternative 1 - Conversion to Groundwater Wells and Pressurized Pipe System	Alternative 2- No Action
Water	Construction - Short-term localized turbidity during cofferdam construction; Negligible water temperature effects; cofferdams to prevent discharges during construction period; Potential impacts mitigated through conditions in permits. O&M - No differences from current conditions. No effects on groundwater from existing conditions; No effect to water quantity; New fish screens sized to accommodate range of flows likely to be required under WDOE order.	Construction – Potential impact in/around rivers, mitigated through conditions in permits. O&M – improved water temperatures because more water left in river; decrease in suspended solids in irrigation water. Development of three groundwater wells would allow more water to be left in the Methow and Twisp rivers above their confluence; Potential impacts on groundwater and existing wells should not affect surface waters; Activity regulated under Hydraulic Project Approval and water quality permit by WDFW; Would be mitigated through WDOE regulation of well locations; Would eliminate groundwater recharge from leaking canals; Water use reduced from 67+ to about 46 cfs or less, depending on WDOE order.	Construction - No impacts. O&M - No impacts. If irrigation is halted, water would at least temporarily remain instream and not flow into the canals; Groundwater flow may be affected due to lack of water in canals providing seepage to groundwater.
Soils	Localized, isolated, short-term erosion impacts from construction; Mitigated through confined area of disturbance and use of erosion prevention measures.	Localized, isolated, erosion impacts from well excavation and laying pipeline; construction mitigated through use of erosion prevention measures.	No erosion impacts; Ongoing impact of soil/substrate movements from annual construction of push-up dam at the West diversion site.
Vegetation	Localized construction disturbance to vegetation; up to about 1.3 total acres of vegetation could be disturbed; Minimal number of trees to be removed; site revegetation plan would accelerate site rehabilitation using native species.	Minor potential for impacts on wetlands, mitigated through careful facility siting and conditions in permits. Impacts on about 33 acres of riparian vegetation from elimination of water from canal seepage; potentially mitigated through land	No impacts to vegetation unless irrigation is halted – in that case impacts to riparian vegetation along the canals similar to Alternative 1 but without potential mitigation.

		owners providing irrigation and through improvements to natural riparian areas along the Twisp and Methow Rivers above their confluence. Potential for weed problems resulting from construction controlled through site rehabilitation and weed control programs.	
Fish	Construction – temporary potential impacts to fish during placement of coffer dam in Methow River due to disturbance and handling. O&M - Substantial fish passage and screening improvements; Would prevent fish mortality and/or injury; Would facilitate fish returns to river that could contribute to increased fish numbers in Subbasin; Would eliminate "take" of ESA-listed species.	Construction – Potential impacts from sedimentation mitigated through conditions in permits; Even greater improvement in fish passage than proposed action through removal of diversions and screens; Return of diversion sites on Methow and Twisp Rivers to more natural conditions. Push up dams at West Diversion no longer needed O&M – Increases in habitat area for anadromous fish and bull trout life stages in the Twisp and Methow rivers above their confluence. Would eliminate take of ESA-listed species	No difference from current conditions: fish would continue to be entrained into irrigation canals; Fish bypass could continue to cause harm to fish; Continued "take" of ESA-listed species unless irrigation canals discontinued under consent decree.
Wildlife	Minor temporary displacement of wildlife during construction; otherwise no long-term consequences to wildlife; minor disturbance to habitat would be mitigated through site rehabilitation to native species and would not cause long-term adverse wildlife effects	Impacts from construction, loss of access to open water in canal and reduction in riparian habitat supported by canal seepage; partially offset by increased in-stream flows benefiting natural riparian habitat along both rivers above their confluence, and maintenance of vegetation by land owners electing to do so. Negligible impacts on endangered or threatened species, except possible displacement of bald eagle perching.	No impacts to wildlife unless irrigation is halted; in that case impacts similar to Alternative 1 except for direct construction impacts.

Cultural Resources	No cultural resource impacts; screens are not considered contributing elements to National Register eligibility of the canal system; Potential benefit to tribal and other anglers if fish numbers were to increase as a result of the project.	Potential construction impacts on historic canal, archaeological sites, and or traditional use sites mitigated through: 1.surveys, 2. careful siting of new facilities, 3. formal recordation of the canal system, and 4. consultation with SHPO and Tribes; Potential benefit to tribal and other anglers if fish numbers were to increase as a result of the project.	No direct effect on cultural resources; Continued impact to tribal and other fisheries due to lower fish numbers unless irrigation is halted.
Socioeconomics/ Land Use [1]	No change in land use; no socioeconomic changes in to local community. Construction costs fully covered by BPA and WDFW = $1.23 million; Annual MVID and O&M costs estimated to be $129,000; [2] Source of funding for possible water conservation improvements uncertain; Only minor O&M changes to the current; would assist BPA and BOR in meeting BiOp #149.	Would resolve growing MVID concerns regarding water conveyance losses; Minor land use changes for new wells or well fields and associated facilities; Funding sources uncertain - possible economic costs to MVID members if Federal, state, or outside funding cannot be obtained; Construction costs estimated at $3.76 million; Annual MVID and O&M costs estimated to be $119,000. O&M costs would raise assessment for those remaining in the district. Benefit to property values for those who would obtain more reliable source of irrigation water; Detriment for those who value aesthetic benefit of canal. Some benefit to future growth and development through deposit of saved water into state water rights trusts; Could result in future growth – induced impacts.	No change to the existing land use; Possible socioeconomic impacts if irrigation is halted; land uses could change if orchards or crops fail as a result; No funds available to protect fish or meet water conservation needs. Annual MVID and O&M costs estimated to be $118,000.

[1] Cost estimates, originally developed in the 1997 EA, have been projected into current year dollars based on a calculated average Consumer Price Index (CPI) from 1997 to the present. These estimates are relatively conservative when compared to other methodologies.

[2] Cost estimate = $117,000 normal MVID O&M, plus $12,000 for MVID subcontract with WDFW for screen reviews and maintenance.

Construction of the fish return pipe would require a corridor that is approximately 20 feet wide for installation of the pipe and the outfall structure. Once the pipe is installed in the trench, the trench would be backfilled and the surface restored and revegetated with native vegetation. Water quality impacts from erosion are expected to be negligible because the work area is isolated by cofferdams, located away from flowing water, and because use of silt fences would prevent eroded materials from reaching the Methow River. All excess material from the pipeline trench would be moved to an acceptable disposal area and not allowed to erode or slough into the Methow River.

West Canal screen work. No inwater work is proposed in the Twisp River. The placement of three coffer dams in the West canal and fish bypass channel would isolate the work area to minimize any possible erosion and turbidity discharges into the Twisp River. Placement of the cofferdams would result in localized and short-term impacts to water quality because of the small size of the cofferdams and the sequencing for placement. The two canal cofferdams and the fish bypass channel cofferdam would each be 400 square feet in size. The cofferdams would be placed in the following sequence to minimize the possibility of water quality impacts:

1. terminate flows to main canal below fish screen
2. install cofferdam No. 1 in main canal downstream of fish screen
3. install temporary fish bypass (95 feet long)
4. terminate flows to existing bypass channel
5. allow flow to pass to new temporary bypass
6. install cofferdam No. 2 down canal of new temporary bypass intake
7. install cofferdam No. 3 just upstream of new temporary bypass outfall.

Construction of the temporary fish bypass at the West canal screen site would have minimal impact on water quality. The proposed fish bypass pipe (about 95 feet long) would be installed in a trench in the dry. Impacts on water quality would occur at the West Canal and at the bypass channel when the trench is connected at the upper and lower ends; however less than 10 to 15 cubic yards of material would be removed at the edges of these areas. The placement of energy dissipation blocks in the side channel at the pipe exit would minimize erosion.

The vegetation removal area for the temporary fish bypass and water bypass pipe corridors would be approximately 10 feet wide. A minimal amount of vegetation and soil would be removed near the connected areas of the pipes. Inwater work would involve installation of the pipe and energy dissipation blocks in the fish bypass channel.

The potential risk of hazardous material spills affecting water quality would be minimized by requiring all machinery fueling and maintenance to occur over 150 feet away from the ordinary high water mark at both sites. Equipment used below the ordinary high water mark would be cleaned and inspected daily to ensure hazardous materials (gas, oil, hydraulic fluid) from normal operation are not introduced into the aquatic environment. Hazardous material containment systems would be on site and available for use. Trained personnel would be required to be on-site to respond immediately to a spill during any phase of construction in which hazardous material may come into contact with the river.

4.1.2 Alternative 1 - Groundwater Well/Pressurized Pipe Irrigation

Impacts to water quantity and quality for both surface and groundwater from Alternative 1 would be very similar to those discussed in the 1997 EA, pages 38-42. The only changes would be:

- the total water use may possibly be reduced below the 46 cfs anticipated in the 1997 EA, depending upon the final WDOE order and subsequent litigation; and
- the exclusion of some MVID members and conversion to individual wells to meet their irrigation needs has already occurred.
- Piping of leaking laterals for efficiency improvements has been completed.

These three changes would not result in impacts not already anticipated in the 1997 EA.

A new study by the U.S. Geological Survey (USGS 2003) looked at the issue of canal seepage to groundwater, which was discussed in the 1997 EA. The new study generally corroborates our conclusions in the 1997 EA, which were that leaking MVID canals do contribute to groundwater. The individual contribution of the MVID canals to the recharge is still not clear from the USGS report; however, it does conclude that the seepage from all of the leaking Methow Basin irrigation canals eventually returns to the rivers and boosts stream flows in late summer and fall. This increase in streamflow appears to taper off by January. If Alternative 1 were to be implemented, this increased streamflow may be reduced by the amount of contribution of the MVID canals, since they would be piped and no longer would leak.

4.1.3 Alternative 2- No Action

The no action alternative would not impact surface or groundwater quality. Water quantity available for irrigation would be drastically affected if NOAA Fisheries halted irrigation due to enforcement of the ESA. Under this scenario, surface and groundwater impacts would be similar to those of Alternative 1. The water normally diverted for irrigation would remain instream and benefit flows in both the Twisp and Methow rivers. Groundwater flows would tend to move from the river out to the surrounding areas instead of being distributed throughout the length of the canal and irrigated areas due to canal seepage and irrigation returns.

4.2 Soils

4.2.1 Proposed Action– Fish Screen Replacement

The total area that would be disturbed by the construction at both project sites is expected to be about 1.3 acres. This includes 0.7 acres for the staging areas, the excavation routes for new fish and temporary water bypass facilities, and/or areas for removal and replacement of the new screens. An additional 0.6 acres (2,080 feet long X 12 feet wide = 24,960 square feet area) of disturbance is expected for trenching and placement of the buried electrical service to both sites. The use of best management practices for erosion control and site grading and revegetation would minimize erosion during construction and accelerate the rehabilitation of disturbed soils and vegetation.

An estimated 2,875 cubic yards of excavated material would be required for various components at the East site, along with about 1,450 cubic yards of backfill, 100 cubic yards of riprap, and about130 cubic yards of concrete. At the West site, an estimated 1,270 cubic yards of excavated material would be required, along with about 390 cubic yards of backfill, 20 cubic

yards of riprap, and about130 cubic yards of concrete. This physical disturbance would, in part, be mitigated by site grading and revegetation upon completion of the screen replacement and constructing the security fencing.

4.2.2 Alternative 1 - Groundwater Well/Pressurized Pipe Irrigation

Impacts to soils would be the same as those discussed in the 1997 EA on pages 64-65.

4.2.3 Alternative 2- No Action

There would be no impacts to soils from the no action alternative.

4.3 Vegetation

4.3.1 Proposed Action– Fish Screen Replacement

An estimated 1.3 acres of vegetation could be disturbed or altered during construction of the fish screen replacements and associated project features. The water and fish bypass pipes would be routed so as to disturb as little native established vegetation as possible. Care would be taken to restrict the number of trees to be removed. An estimated 10 live and 10 downed trees are expected to be removed at the East site, and up to 15 trees would be disturbed at the West site to complete the screen replacement and reshape the canals proximal to the fish screens. The trees to be removed would be alder, black cottonwood, and box elder.

Marginal wetland plant representation is observed along the canals at the screen sites. However, since riparian areas have been artificially created by the irrigation facilities and do not meet the hydric soils criteria for official designation as wetland, they are not protected under Federal, state, or local laws or regulations. Long-term alteration of wetland values, uses, and functions are not expected from implementation of the proposed action. No net wetland loss would be expected from implementation of the proposed project.

One ESA-listed plant, Ute ladies' tresses, is potentially found in the area. This species was not found to be in the area during two separate botanical surveys. See chapter 5.2 for a more detailed discussion on Endangered Species Act consultation for this and other listed species.

Disturbed areas and newly exposed earth banks would be seeded with an erosion control plant mix immediately after completion of construction. Revegetation with native vegetation would be completed in the summer or fall of 2004, depending on weather conditions.

4.3.2 Alternative 1 - Groundwater Well/Pressurized Pipe Irrigation

Impacts to vegetation from Alternative 1 would be very similar to those discussed in the 1997 EA, pages 69-72. Vegetation growing along canals that have been accustomed to receiving annual water would no longer rely on that water source because water would no longer be provided in these open water environments. The only change is that Ute ladies'-tresses is now listed under the ESA. This species was not found to be in the area during two separate botanical surveys. See Chapter 5.2 for a more detailed discussion on Endangered Species Act consultation for this and the other listed species.

4.3.3 Alternative 2- No Action

The no action alternative would not impact (positively or negatively) vegetation unless irrigation was halted for more than a year. In that case, impacts to riparian vegetation would be similar to that described for Alternative 1, where dewatering would likely affect the plants that are represented along the canals. However, the potential mitigation for impacts to vegetation along the canals would most likely not be available.

4.4 Fish

4.4.1 Proposed Action– Fish Screen Replacement

The proposed replacement of the fish screens would offer long-term biological protection and comply with current Federal and state fish screen and passage standards and criteria (NMFS 1995 and 1996) for the ESA-listed fish in the project area, while maintaining the MVID's access to irrigation water. The screen upgrades would likely provide optimal long-term protection for all listed fish species and life stages, thereby resulting in long-term beneficial effects to these fish populations. The fish screens would meet the requirement for openings of 3/32 inch or less, would be angled to the flow to minimize impact injuries, and would facilitate fish bypass back to either the Methow River or Twisp rivers. The screens are specifically designed to prevent entrapment against the screens, and prevent entrainment of both the anadromous and resident fish into the irrigation canal. Additionally, replacing and upgrading the existing fish screens would be a means to support fish conservation and protection.

On-going evaluations conducted in other Washington state basins confirm that fish screens constructed to current criteria and properly operated and maintained protect fry from injury/mortality and achieve bypass guidance rates in the 90 to 99% range. Studies in the Yakima Basin, as an example, have shown that survival and guidance rates associated with fish movement through new fish screen facilities range from 95 to 100 percent.

The life history timing for Chinook, steelhead, and bull trout in the project area is shown in Table 6. During the anticipated construction dates (April – June, 2004), several different life stages of these species are likely to be present at the East and West canal screen sites. The primary conflict in timing would occur with juvenile rearing, downstream migration of juvenile/smolt fish, and possibly juvenile incubation/emergence. Rearing basically occurs all year while the majority of downstream smolt migration occurs between spring and late summer or fall. The project would also partially overlap with upstream migration for spring chinook and summer steelhead, and some overlap could occur with summer steelhead spawning.

The general allowable instream work window established for the Methow River from its confluence at the Columbia River to Winthrop, Washington is July 15 to September 30, and the general work window for the Twisp River is July 15 to August 31 (pers. com. Connie Iten, WDFW, October 26, 2003). Normal instream work windows are established based on the life history timings in the local areas to avoid/minimize direct adverse impacts to fish that could be affected during construction activities. The construction period for the proposed action would not be within these acceptable instream work windows, and may therefore affect certain components of the normal life cycle of individual fish species in the project area. For example, Table 6 identifies the following fish life history activities in the Methow and Twisp rivers during the proposed construction period: juvenile rearing: fall Chinook steelhead and bull trout;

juvenile migration downstream: spring and summer Chinook, steelhead; spawning steelhead; and returning adults: spring Chinook and steelhead; and incubation emergence: summer Chinook, steelhead, and bull trout. Construction during any of these life stages could interfere with ability of fish to continue their life requirements if these species are in the project areas; however, the only instream work that would affect fish is the placement and removal of the proposed cofferdam in the Methow River that is intended to isolate the work area for construction of the fish bypass outfall. There is no known critical or important fish habitat present in that location of the Methow. Also, NOAA Fisheries staff believe that getting the fish screens replaced as soon as possible, even if it has to occur outside of the acceptable work window, is more beneficial to fish than waiting for the work window. We further believe that any direct working interface in the river that could affect fish would be very localized and short lived, with minimal associated disturbance to fish. BPA has initiated consultation with the NOAA Fisheries on Chinook salmon and steelhead in accordance with Section 7 of the ESA, to reduce any potential adverse impacts dues to timing of construction. We expect to arrive at a conclusion by the time the final EA is completed. Chapter 5.2 further discusses compliance with the ESA.

As mentioned above, inwater work is expected at the East diversion site during construction of the fish bypass outfall and the temporary water bypass to the canal. The habitats present at the two inwater sites are not expected to normally attract large numbers of fish. Installation of the cofferdam for the fish bypass pipe outfall in the Methow River likely would minimally affect adult fish passage. The construction area for the bypass pipe is on the side of the river that is not a migration corridor. Juvenile fish passage should not be affected by the construction activities. Heavy equipment construction noise is expected to create marginal disturbances to juvenile or adult fish that may be proximal to these inwater work sites. This is due to the short duration of work and localized work expected. Minor short-term turbidity is expected.

No inwater work would occur in the Twisp River, although some work would occur in the West diversion canal and the fish bypass channel. Noise and vibration created during construction and heavy equipment operation within the project area of the river could marginally affect resident and anadromous fish that could be present in the nearby area. Potential adverse effects would be minimized by restricting disturbance to a small area, using best management practices, and the fact that the level and duration of these activities are expected to be limited.

During the early construction phases, standard practices would be employed to isolate the work areas from the adjacent aquatic environments through the placement of coffer structures. During dewatering, it is possible that some juvenile fish could become inadvertently trapped between the coffer structures and the existing screen structures. If this would be the case, special care would be employed to return the stranded fish back to the river in a safe manner. During removal of existing screens and replacement of the new screens, no fish injury or mortality is anticipated, as the cofferdams will be in place to protect fish.

Fish passage is an integral component of the proposed fish screens. During construction on the East diversion fish screen, no temporary fish passage is needed and the work site would be totally isolated from the river via cofferdams. For fish that enter the East diversion canal during project operation, the new screens and permanent fish bypass would facilitate easy and safe access back to the Methow River. The new fish bypass pipe outlet will permanently impact approximately 1,600 square feet (0.037 acres) of fish habitat along the east bank of the Methow

River. This will be offset by the removal and rehabilitation of the old bypass pipe outlet immediately upstream of the new outlet.

On the West canal, temporary fish passage would be provided during construction through a 75-foot long bypass to connect the beginning portion of the canal with the existing natural fish bypass channel. This temporary fish bypass would allow surface water and fish passage around the project site, either upstream or downstream, while the new screens are being installed. Fish passage during construction may be minimally affected by construction as a result of cofferdam placement. The duration of impact to fish passage would be less than 2 hours as the cofferdam is constructed. No negative effects on fish passage are anticipated as a result of the temporary passage pipe.

4.4.2 Alternative 1 - Groundwater Well/Pressurized Pipe Irrigation

Impacts to fish from Alternative 1 would be very similar to those discussed in the 1997 EA, pages 52-58. The only change is that summer steelhead, spring chinook salmon, and bull trout are now all listed under the Endangered Species Act in the project area. See chapter 5.2 for a more detailed discussion on Endangered Species Act consultation for this and the other listed species.

4.4.3 Alternative 2- No Action

The no action alternative would result in continued impacts to both listed and non-listed fish in the Twisp and Methow rivers. Unless irrigation was halted, juvenile fish would continue to be entrained into the canals through the screens, and/or be injured by the screens or the bypass pipe. NOAA Fisheries has documented that juvenile fish are making their way past the screens and can be found in the canals downstream of the screens. If irrigation were halted, the East Canal can be shut off entirely with no possibilities of fish passage into the system, but the West Canal would most likely be required to divert a 5 cfs flow to the bypass channel, thereby continuing to expose juvenile fish to possible entrainment and/or injury at the screen.

4.5 Wildlife

4.5.1 Proposed Action– Fish Screen Replacement

Construction impacts to wildlife habitat at the fish screen sites are discussed under vegetation in chapter 4.3.1 above. Removal of the vegetation is not expected to adversely affect wildlife, however a bird nesting survey of the trees to be removed would be conducted prior to construction, and measures taken to prevent impacts to nesting.

Noise and human-related commotion caused by construction is not expected to produce high decibel levels for prolonged periods. However, some wildlife may be temporarily displaced from the sites during construction related activities and be forced to temporarily relocate until work is completed and the crews leave the construction sites. The temporary displacement is not expected to cause long-term consequences to movement patterns or interrupt life history patterns. Because water quantity is not expected to change from the current seasonal fluctuations, wildlife use is therefore not expected to change.

The ESA-listed wildlife species that could be affected by construction and operation of the proposed project are: bald eagle, northern spotted owl, gray wolf, grizzly bear, and Canada lynx. BPA has initiated consultation with the FWS on these species in accordance with Section 7 of the ESA, and we expect to arrive at a conclusion by the time the final EA is completed. Chapter 5.2 further discusses compliance with the ESA.

4.5.2 Alternative 1 - Groundwater Well/Pressurized Pipe Irrigation

Impacts to wildlife from Alternative 1 would be very similar to those discussed in the 1997 EA, pages 82-83. The only change is that Canada lynx has been listed under the Endangered Species Act as a threatened species in the project area. See chapter 5.2 for a more detailed discussion on Endangered Species Act consultation for this and the other listed species.

4.5.3 Alternative 2- No Action

The no action alternative would not impact wildlife unless irrigation was halted for several years. In that case, impacts to wildlife resulting from changes to riparian vegetation along the canals and in the riparian areas of the Methow and Twisp rivers downstream of the diversions would be similar to those of Alternative 1.

4.6 Cultural Resources

4.6.1 Proposed Action– Fish Screen Replacement

The proposed action would not adversely impact cultural resources. A recent cultural resources survey of the proposed fish screen replacement project was conducted on November 8, 2003 that included all components of the East and West fish screen replacement project. No cultural resources were identified at the screen sites or along the appurtenant facilities (bypasses, electrical service alignments).

4.6.2 Alternative 1 - Groundwater Well/Pressurized Pipe Irrigation

Impacts to cultural resources would be the same as those discussed in the 1997 EA on page 95.

4.6.3 Alternative 2- No Action

There would be no direct impacts to cultural resources from the no action alternative; the existing impact to tribal and other fisheries due to the losses of fish into the canals, screens, and bypasses would continue unless irrigation was halted.

4.7 Socioeconomics and Land Use

4.7.1 Proposed Action – Fish Screen Replacement

Construction of the fish screen upgrades is not expected to alter the socioeconomics of the local or regional community. No changes are expected to property values, land use, the local economy, or Methow Valley growth and development as a result of implementing the proposed

action. The irrigators would continue receiving water in the same manner as they have the last few years.

The newly constructed screens would only slightly change the visual appearances of the East and West canal and diversion sites. However, it is not expected that these changes would be detrimental. Revegetation of the sites with native vegetation would improve the visual landscape of the East canal site.

Because BPA and WDFW would largely absorb the costs for this proposal, there would be no economic constraints placed upon the local or regional community. The MVID would be responsible for the operation and maintenance of the new screens to ensure the new facilities function properly and troubleshoot any problems/constraints that may arise in the future. The screens have an estimated life span of up to 50 years, which could be extended with good maintenance. The O&M costs would not be markedly higher than those currently incurred by the MVID for the existing screens. MVID irrigation assessments are currently lower than similarly situated districts.

4.7.2 Alternative 1 - Groundwater Well/Pressurized Pipe Irrigation

Impacts to socioeconomics and land use from Alternative 1 would be very similar to those discussed in the 1997 EA on pages 87-89. However, cost estimates, originally developed in the 1997 EA, have been projected into current year dollars based on a calculated average Consumer Price Index. The major differences are:

- The current estimated cost of this alternative is $5.24 million, which includes $1.48 million in reimbursements to members who leave the district. The members have already been excluded and the reimbursement is expected to be completed by March 2004. Construction costs to implement this alternative would be about $3.76 million.

- Currently, there is no funding source identified for this alternative. Monies set aside by BPA for this alternative have been designated for reimbursement of the members leaving the district, the already implemented on-farm efficiencies (including replacement of the lateral feeds from the canals to the fields), and the remainder is currently earmarked for the fish screen replacement work, pending environmental review.

- Annual O&M costs are estimated to be $119,000. This estimate includes costs for electricity for pumping water. Costs have inflated in general since 1997, and costs for electricity have increased even more rapidly than other costs.

4.7.3 Alternative 2- No Action

Under the no action alternative, BPA funding would not be available. The MVID would need to seek alternative funding sources or assess its members for the costs of the fish screen replacements. If alternative funding could not be secured, the MVID would likely be in violation of its consent decree (see chapter 1.3.2) and NOAA Fisheries could halt irrigation. If this would occur, socioeconomic impacts could ultimately include loss of annual crops and orchards, and adverse effects on hay production. Over time, this could lead to changes in land use from agricultural to other uses and lower land values.

4.8 Cumulative Impacts

Cumulative impacts can result from "individually minor but collectively significant actions taking place over a period of time " (40 CFR 1508.7). These impacts are recognized as the effects of future activities that are reasonably certain to occur in the watershed (CEQ 1997). The MVID project is one of several hundred past and present watershed management projects initiated under the Northwest Power Planning Council's Fish and Wildlife Program.

In its Watershed Management Program EIS, and subsequently in the Fish and Wildlife Implementation Plan EIS, BPA addressed the need to establish a comprehensive and consistent strategy to guide implementation of its fish and wildlife mitigation and recovery program (BPA, 1997c; BPA, 2003). The cumulative impacts of future watershed management projects considered together with past, present, and future human actions in the Columbia River Basin, were addressed in these documents. These EISs concluded that overall, watershed management throughout the Columbia River Basin would provide a net benefit to water quality, fish, and fish habitat, as well as to other natural resources such as soils, vegetation, and wildlife.

In the 1997 EA, BPA considered a variety of alternative actions that could address the broader need and purposes outlined for the MVID rehabilitation project (BPA, 1997b). Some of these broader needs and purposes have been at least partially met with the actions that have occurred to date. However, if the proposed action is selected, the MVID may need to take additional actions to be able to meet the pending WDOE order while still providing an adequate supply of water to its members. The BOR is currently drafting plans that would upgrade the MVID diversions to address fish passage problems and replace the annual push-up dam on the Twisp River (West canal diversion) with a more permanent, reliable and fish-friendly structure. In addition, the MVID may need to repair or replace portions of the remaining canals to slow or stop the leaking of water from them. These actions are, in part, dependent on the final WDOE supplemental order to address excessive conveyance losses of the MVID irrigation system. No funding has yet been identified for implementing these actions but, to the extent possible, they have been addressed in this preliminary EA.

These additional actions would not be necessary under Alternative 1. However, Alternative 1, if implemented, would pose a different set of cumulative impacts, repeated here from the 1997 EA:

- the cumulative impacts on the groundwater aquifer and the Methow and Twisp rivers of changing the MVID diversions from direct withdrawals from the two rivers to individual wells or a combination of individual and community wells;
- the cumulative impact of loss of water-dependent vegetation and wildlife habitat along the canal along with past and present losses due to other factors; and
- the cumulative impact of higher assessment costs to MVID members who must deal with past, present, and future increases in costs due to other factors, which may lead to a shift from agriculture to other land uses.

These impacts have been addressed both in the 1997 EA and this preliminary EA, but are summarized in this chapter as well, so that overall cumulative impacts that involve multiple resources are addressed. In addition, this alternative, in combination with other implemented MVID actions taken, could collectively add to beneficial effects to fish passage, water conveyance efficiency, and preservation of irrigated land use in the Methow Valley.

CHAPTER 5 ENVIRONMENTAL CONSULTATION, REVIEW AND PERMITS

5.1 National Environmental Policy

This preliminary EA is prepared in accordance with the National Environmental Policy Act (NEPA) (42 USC 4321 et seq.) and implementing regulations, which require Federal agencies to assess the impacts of their proposed actions on the environment. Under NEPA, BPA has the option to prepare an environmental assessment to provide evidence and analysis for determining whether to prepare an environmental impact statement, or a finding of no significant impact (FONSI).

5.2 Endangered Species Act

A biological assessment (BA) was prepared in 1997 and again in 1999 to address impacts on threatened and endangered species of previous MVID proposals in accordance with Section 7 of the ESA, (BPA, 1997a and BPA, 1999). These previous MVID proposals had some elements common to the present proposed project. The responses BPA received from the agencies are summarized in Table 9. However as a result of the current proposal, and due to the updated list of ESA species since 1999, BPA has reinitiated consultation with the FWS and NOAA Fisheries. For species under their jurisdiction (see Table 7), BPA contracted a BA for the FWS to reflect the fish screen replacement project that is now proposed (Craven Consulting Group, 2003). Once finalized, the BA will be sent to the FWS for their review and concurrence. Our determination for the bald eagle, northern spotted owl, gray wolf, grizzly bear, Canada lynx, and bull trout is “may effect, not likely to adversely affect.” Our determination for the Ute ladies’-tresses is “will not affect.”

Table 9. Agency Responses to Previous MVID ESA Consultations

Biological Assessment Reference	Agency Response Date	Responding Agency	Response Comments
BPA, 1997a	Oct. 1997	FWS	FWS concurred with BPA that the project [Alternative 1 as described in this EA] would have no effect to the Northern spotted owl, grizzly bear or gray wolf, and may affect but would not adversely affect the bald eagle
BPA, 1997a	Dec. 1997	NMFS	Concurred that the project [Alternative 1 as described in this EA] would not likely affect the listed Columbia River steelhead
BPA, 1999	Jan. 2000	FWS	Concurred that the on-farm conservation and lateral replacement project is not likely to adversely affect the bull trout and Ute ladies’-tresses, and would not affect the Canada lynx
BPA, 1999	Feb. 2000	NMFS	Concurred that the on-farm conservation and lateral replacement project is not likely to adversely affect the Upper Columbia River steelhead or the Upper Columbia River spring Chinook salmon or adversely modify any proposed critical habitat

Consultation has also been initiated with NOAA Fisheries, specifically for the ESA-listed anadromous fish under their jurisdiction (see Table 6). To initiate consultation with NOAA Fisheries, BPA is using the Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Habitat Improvement Program (HIP) in the Columbia River Basin (NOAA Fisheries, 2003b).

Accordingly, because the proposed MVID project qualifies under Category 2 – "Small Scale Instream Habitat Actions – Fish Passage Activities" we have initiated ESA consultation with NOAA Fisheries under this new streamlined process. The results of these consultation efforts will be documented in the final EA. We expect to receive ESA Section 7 concurrence from the FWS and NOAA Fisheries prior to project construction.

5.3 National Historic Preservation Act

The MVID canal system was recommended as eligible for inclusion on the National Register of Historic Places (National Register), under Criterion A (property associated with events that have made a significant contribution to the broad patterns of our history). The system has been the most prominent irrigation feature in the Methow Valley. Although neglect and numerous changes in the structural materials have caused substantial deterioration, both the east and west canals are still mostly located in the original rights-of-way.

The current fish screens were constructed after the canal systems were built, and were replaced in the 1960s and 1970s. Therefore, the screens are considered non-contributing elements of the National Register eligibility. In surveys conducted 1996 and November 2003, no cultural resources were identified in the vicinity of the fish screens, bypass pipe routes, or electrical service alignments. Prior to construction, BPA will obtain concurrence from the Washington State Historic Preservation Office on our determination of No Effect to cultural resources for the proposed action.

If Alternative 1 is selected, BPA would implement the provisions of its Memorandum of Agreement with the Washington State Historic Preservation Office concerning the mitigation required for effects to the historic irrigation canal system.

5.4 Coastal Management, Shorelines, Wetlands, and Hydraulic Approval

A Washington Joint Aquatic Resource Permits Application (JARPA) was prepared and sent to the WDFW and the local government by the MVID on September 8, 2003. The JARPA is an application form that consolidates up to seven permit application for state and local permits in the state of Washington, and also serves as the mechanism to apply for appropriate Clean Water Act Section 404 permits, if needed, as well. Specifically, the JARPA was filed for a Hydraulic Project Approval (HPA) (http://www.wa.gov/wdfw/hab/hpapage.htm) and State Environmental Policy Act (SEPA) clearance. Part of the project would be in a wetted perimeter of the Methow River and will require a Hydraulic Project Approval. Under state law known as "Hydraulic Code" (RCW 75.20.100-160), the HPA is intended to regulate construction in a manner that prevents damage to the state's fish, shellfish, and their habitat. The project is currently being reviewed by the WDFW who administers that program for the state of Washington. The SEPA is currently being reviewed by the WDOE.

Because the proposed project would not take place in navigable waters and because less than 25 cubic yards of fill would be deposited in wetlands, a Federal Corps of Engineers Clean Water Act Section 404 permit would not be required for implementation of the proposed action. Most riparian areas along the canals are not jurisdictional wetlands because they are artificially established and do not meet the soils characteristics to be classified as wetland, or they are upland riparian areas (Parametrix, 1995).

The Coastal Zone Management Act of 1972 requires that Federal actions directly affecting the coastal zone be undertaken in a manner consistent, to the maximum extent possible, with the State's coastal zone management program. Washington's coastal zone management program is implemented through the provisions of the State Shorelines Management Act, including shoreline management programs developed/administered by the counties. The Coastal Zone Act Reauthorization Amendments of 1990 also require that proposed Federal facilities fully comply with Federal consistency requirements, as determined by and through consultation with a designated coastal zone management agency. County jurisdiction is invoked under the Shoreline Master Program for projects within 200 ft. of the ordinary high-water mark of Shorelines of Statewide Significance (or within the 100-year floodplain), or for projects requiring a floodplain development permit (Okanogan County, 1997). The Twisp and Methow rivers and their associated wetlands are considered shorelines of Statewide Significance.

Wherever possible, construction in jurisdictional wetlands or shoreline areas would be avoided, and MVID groundwater pumping would be designed to avoid affecting surface jurisdictional wetlands through groundwater withdrawal. Facilities built by local landowners would be regulated by Federal and county agencies with jurisdiction over wetlands and waters protection. In addition, BPA would take the following measures, when practicable, to assure consistency with the county's Shoreline Master Plan.

Location of structures within the identified shoreline would be avoided if possible. If locations within the shoreline area could not be avoided, BPA would consult with the appropriate state and local agencies to determine the best placement of the structure. In shoreline areas, disturbed land would be restored as closely as possible to pre-project contours and replanted with native and local species. However, there might be locations where site topography would require bank disruption. A restoration and monitoring plan would be prepared before shoreline areas were disturbed. Erosion control measures would be implemented within the 200 feet shoreline area.

5.5 Local Plans

The proposed MVID actions would be located in areas covered by the Okanogan County Comprehensive Plan and the Methow Valley Plan, an addendum to the comprehensive plan. The comprehensive plan is a declaration of policies, but as such, contains no regulations or minimum standards. Most of the MVID system is located in either the Methow Valley Review District's Uplands zoning district (20-acre minimum lot size) or the MVRD 5 zone (5-acre minimum lot size). The irrigation facilities are consistent with these zonings.

Critical Area Regulations

Okanogan County adopted critical area regulations under the State's Growth Management Act of 1990, as amended, to protect wetlands, areas with critical recharging effects on potable water, frequently flooded areas, geologically hazardous areas and fish and wildlife habitat conservation areas. The existing and proposed MVID facilities are located in some of these areas. WDOE and MVID will continue to coordinate the proposed actions with the county planning department to specifically address any concerns regarding zoning or conflict with critical areas.

5.6 Farmlands

The Farmland Protection Policy Act (7 U.S.C. 4201 et. seq.) requires BPA to identify and quantify adverse impacts of the proposed action on farmlands. The location and extent of prime and other important farmlands designated by the Natural Resource Conservation Service (NRCS; formerly Soil Conservation Service) were obtained from NRCS soil survey information. The NRCS has designated most of the soils on the valley bottoms as farmland of statewide importance. The proposed project and alternative 1 would not cause a change to the agricultural use of farmlands, and it would not jeopardize the continued existence of area farms. The no action alternative, however, could directly influence disposition of water conveyance through the canals and to agricultural fields. If the consent decree was enforced under the no action alternative, irrigation diversions could be halted, resulting in no water available for irrigating farmlands.

5.7 Wild and Scenic Rivers

The Methow River system, including the entire Twisp River and over half of its tributaries, has been recommended for inclusion in the Washington State Scenic Rivers Program. The Twisp River is considered a River of Statewide Significance. The proposed action and alternatives would not affect these designations.

CHAPTER 6 REFERENCES

Archaeological and Historical Services. 1996. A Cultural Resources Survey of the West Side and East Side Canals, Methow Valley Irrigation District, Okanogan County, Washington. Short Report 535, Archaeological and Historical Services, Eastern Washington University. Cheney, WA. December 1996. 18 pp.

Bernheisel, Lee. 2003. Ltr. from L. Berheisel (Okanogan Wilderness League) to Carl Keller, (BPA). Letter w/attached studies, reports, correspondence, adjudicative findings, etc. Carlton, WA. November 8, 2003. 1p.

Bonneville Power Administration (BPA). 2003. Fish and Wildlife Implementation Plan Final EIS, Piecing the Puzzle Together. DOE/EIS-0312. Bonneville Power Administration. Portland, OR. 3 volumes. April 2003.

Bonneville Power Administration (BPA). 1999. Methow Valley Irrigation District Project – Biological Assessment for Summer Steelhead, Spring Chinook Salmon, Butt Trout, Canada Lynx, and Ute Ladies'-Tresses. Prepared by Harza Engineering Company. Portland, OR. December 8, 1999. 25pp.

Bonneville Power Administration (BPA). 1997a. Methow Valley Irrigation District Project – Biological Assessment for Summer Steelhead Trout. Submitted to the National Marine Fisheries Service. BPA. October 1997. Portland, OR. 17pp.

Bonneville Power Administration (BPA). 1997b. Methow Valley Irrigation District Project – Final Environmental Assessment and Finding of No Significant Impacts DOE/EA-1181. Bonneville Power Administration in cooperation with the Washington Department of Ecology, the Methow Valley Irrigation District, and the Yakama Indian Nation, and the Confederated Tribes of the Colville Reservation. Portland, OR. December 1997. 120pp. w/appendices.

Bonneville Power Administration (BPA). 1997c. Watershed Management Program – Final Environmental Impact Statement. DOE/EIS-0265. Portland, OR. July, 1997. 148pp. w/glossary, index, appendices, tables, and Figures.

Caldwell, B and D. Catterson. 1992. Methow River Basin Fish Habitat Analysis Using the Intream Flow Incremental Methodology. Washington Department of Ecology. Olympia, WA.

Carlson, Dennis J. 2002. Supplemental Declaration of Dennis J. Carson. Declaration provided in the U.S. District Court for the Easter District of Washington. Executed at Lacey, WA. 10pp.

Council on Environmental Quality. 1997. Considering Cumulative Effects Under the National Environmental Policy Act. Executive Office of the President. Washington, D.C. January 1997. 64p. w/appendices.

Cowardin, L.M., V. Carter, F.C. Golet and E.T. LaRoe. 1979. Classification of Wetland and Deepwater Habitats of the United States. FWS/OBS-79-31. U.S. Fish and Wildlife

Service. Washington, D.C. 103pp.

Columbia River Inter-Tribal Fish Commission (CRITFC). 1995. WY-KAN-USH-MI WA-KISH -WIT: Spirit of the Salmon. The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs and Yakama Tribes. Vol. I.

Craven Consulting Group. 2003. Draft Methow Valley Irrigation District Fish Screen Project – East Side Canal Site - Methow River, West Side Canal Site – Twisp River – Biological Assessment and Essential Fish Habitat Assessment for Species under NOAA Fisheries and U.S. Fish and Wildlife Service Jurisdictional. Draft prepared by Craven Consulting Group for BPA. October 21, 2003. Oregon City, OR. 30pp. w/appendices, tables, figures.

Earthjustice. 2003. Letter from Earthjustice to BPA. Seattle, WA. September 10, 2003. 3pp.

Franklin, J.F. and C.T. Dyrness. 1988. Natural Vegetation of Oregon and Washington. Oregon State University Press. Corvallis, OR

Fulkerson, Cathy. 1988. Predictive Locational Modeling of Aboriginal Sites in the Methow River Area, North-Central, Washington. Department of Anthropology, Washington State University. Pullman, WA.

Jolley, Vaughn, Greg Nordang, and Mike Gage. 2000. Ltr. From MVID Directors to Tom Fitzsimmons (Washington Department of Ecology). Letter from Twisp, WA. July 3, 2000. 5pp.

Klohn Leonoff Cinsulting Engineers. 1990. Water Management Plan for Methow Valley Irrigation District. Report PW06166 0101. Kirkland, WA. January 19, 1990.

Konrad, Christopher P., Brian W. Drost, and Richard J. Wagner. 2003. Hydrogeology of the Unconsolidated Sediments, Water Quality, and Ground-Water/Surface Water Exchanges in the Methow River Basin, Okanogan County, Washington. U.S. Geological Survey, Water Resources Investigations Report 03-4244. Prepared in Cooperation with Okanogan County. Tacoma, WA. 137pp.

Methow Valley Water Pilot Planning Project Planning Committee. 1994. Draft Methow River Basin Plan. January 27, 1994.

Montgomery Water Group (MWG). 1996. Methow Valley Irrigation District Water Supply Facility Plan, Vols. I II, Appendices. Montgomery Water Group, Inc., Kirkland, WA.

NOAA Fisheries. 2003a. DRAFT Anadromous Salmonid Passage Facility Guidelines and Criteria. NOAA Fisheries, Northwest Region Hydro Program Engineering Staff. Draft for Internal NOAA Fisheries discussion only. Portland, OR. January 2003.

National Marine Fisheries Service (NOAA Fisheries), Northwest Region. 2003b. Endangered Species Act Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation; Habitat

Improvement Program – Columbia River Basin. Document 2002/00/750. NOAA Fisheries, D. Robert Lohn. Portland, OR. August 1, 2003. 260pp. w/appendices.

National Marine Fisheries Service (NMFS). 2002. Finding Regarding Adequacy of the FCRPS Action Agencies – 2002 Annual Implementation Plan. National Marine Fisheries Service Northwest Region. Portland, OR. July 30, 2002. 46pp. w/appendix A.

National Marine Fisheries Service (NMFS). 2000. Reinitiation of Consultation on Operation of the Federal Columbia River Power System, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin. NMFS Northwest Region. Portland, OR. December 21, 2000. 12 chapters w/appendices, tables, figures.

National Marine Fisheries Service (NMFS). 1995 and 1996. Juvenile Fish Screen Criteria (revised Feb. 16, 1995) and Addendum: Juvenile Fish Screen Criteria for Pump Intakes (May 9, 1996 (guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens).

Nordlund, Bryan D. 2002. Supplemental Declaration of Byran D. Nordlund. Declaration provided in the U.S. District Court for the Easter District of Washington. Executed at Portland, OR. April 9, 2001.

Nordlund, Bryan D. 2000. Declaration of Byran D. Nordlund. Declaration provided in the U.S. District Court for the Easter District of Washington. Executed at Portland, OR. May 4, 2000.

Okanogan County. 1994. Growth Management Critical Areas Regulations. Okanogan County, Office of Planning and Development, Okanogan, WA.

Okanogan Wilderness League. 2003. Ltr. From OWL to Tom Kerier (Northwest Power Planning Council). Carlton, WA. August 22, 2003. 2pp.

Okanogan Wilderness League. 1993. Ltr. From OWL to Doug Clausing (Washington Department of Ecology). Carlton, WA. April 8, 1993. 1p.

Okanogan Wilderness League. 1991. Ltr. From OWL to Heidi Adelsman (Washington Department of Ecology). Carlton, WA. March 18, 1991. 2pp.

Okanogan Wilderness League. 1989. Ltr. From OWL to George Krill (Washington Department of Ecology). Carlton, WA. November 30, 1989. 3pp. w/ MVID Draft Report Partial Analysis.

Parametrix, Inc. 1995. Wetland Assessment for the Methow Valley Irrigation District Water Conservation Plan. Montgomery Water Group. Parametrix, Inc. Kirkland, WA

Spier, Leslie. 1936. Tribal Distribution in Washington. General Series in Anthropology, No. 3. George Banta Publishing Company, Menasha, WI.

Teit, James A. 1928. The Middle Columbia Salish. University of Washington Publications in

Anthropology 2(4):89-128. University of Washington Press. Seattle, WA.

U.S. Bureau of Reclamation (BOR). 2003a. Draft Predesign Memorandum – Methow Valley Irrigation District MVID East Diversion Canal; Fish Screen Replacement Structures. Bureau of Reclamation, PN Region Design Group. Boise, ID. ESA FCRPS- BiOP. April, 2003. 17 pp w/appendices.

U.S. Bureau of Reclamation (BOR). 2003b. Draft Predesign Memorandum – Methow Valley Irrigation District MVID West Diversion Canal; Diversion Screen Modifications. Bureau of Reclamation, PN Region Design Group. Boise, ID. ESA FCRPS- BiOP. April, 2003. 14 pp w/appendices.

U.S. Forest Service. 1997. Amphibians, Reptiles, Birds, and Mammals Known or Suspected to Occur on the Okanogan National Forest. U.S. Forest Service, Twisp District Office. Twisp, WA. Unpublished list.

Washington Department of Ecology (WDOE). 1992. Methow River Basin Fish Habitat Analysis Using the In-stream Flow Incremental Methodology. Department of Ecology, Olympia, WA.

Washington Department of Fish and Wildlife (WDFW)). 2001. Draft Methow Subbasin Summary. Prepared for the Northwest Power Planning Council. October 5, 2001. 138.pp.

Washington Department of Wildlife (WDW), Confederated Tribes and Bands of the Yakima Indian Nation, Confederate Tribes of the Colville Indian reservation, and Washington Department of Fisheries. 1990. Columbia Basin System Planning Production Plan: Methow and Okanogan Rivers Subbasin Salmon and Steelhead Production Plan. WDW. Olympia, WA.

Washington Pollution Control Hearings Board WPCHB). 2003. Findings of Fact, Conclusion of Law and Order, PCHB No. 02-071 and PCHB 02-074. Lacey, WA. August 20, 2003. 26pp.

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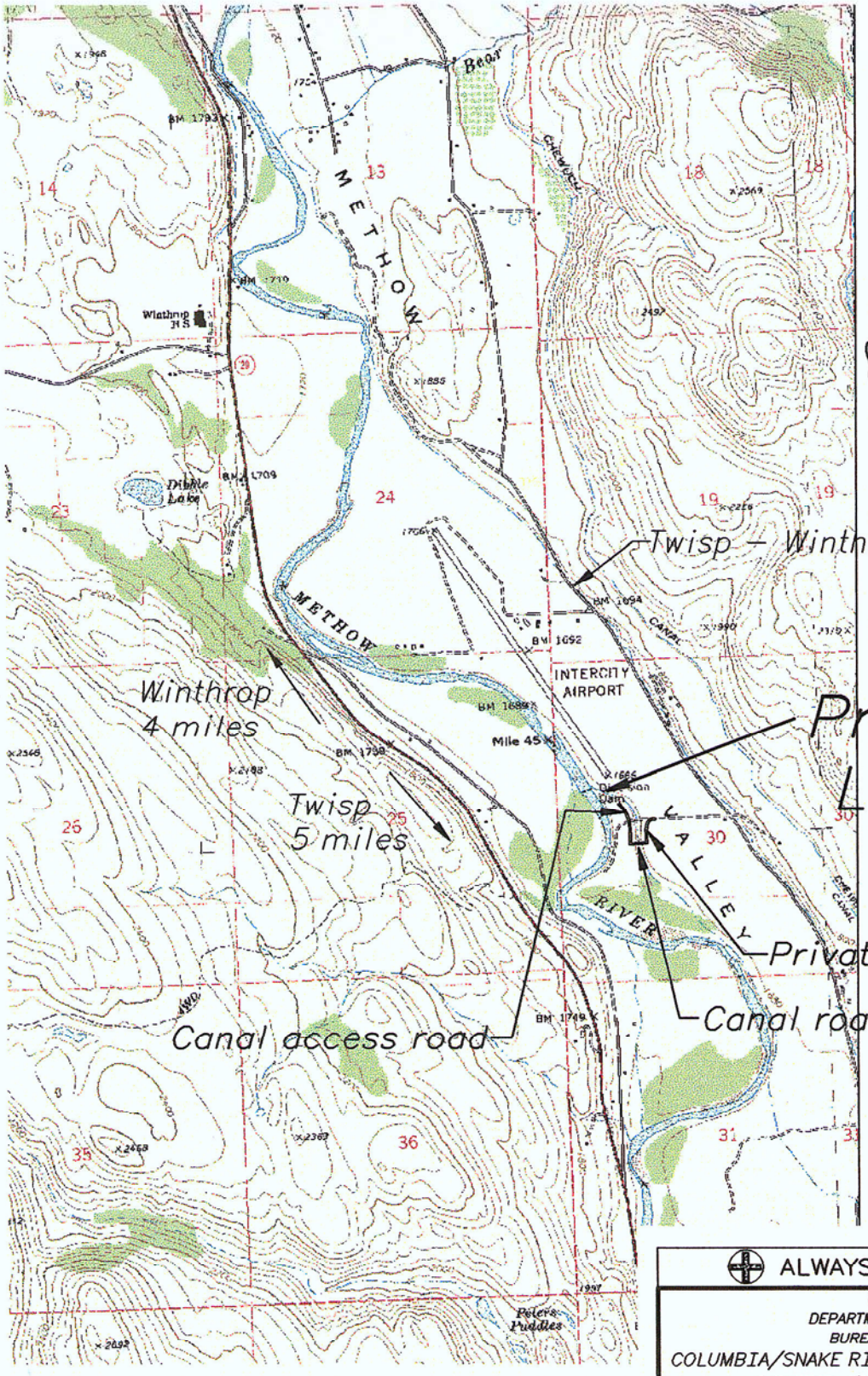
APPENDIX A
MVID East Fish Screen Structure



0 1 1.5
SCALE OF MILES

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID EAST DIVERSION
LOCATION MAP

DESIGNED	TECH. APPROVAL
DRAWN GGrooms	SUBMITTED
CHECKED	APPROVED REGIONAL ENGINEER
CADD SYSTEM AutoCAD Rel. 15.06	CADD FILENAME 1678-100-305.DWG
BOISE, IDAHO MAY 1, 2003	1678-100-305

DATE AND TIME PLOTTED
AUGUST 1, 2003 10:41
PLOTTED BY
EMORDHORST

SURVEY CONTROL POINTS				
Number	Northing	Easting	Elevation	Description
1	518,321.24	1,808,601.04	1686.73	rebar
2	518,399.46	1,808,511.84	1689.29	rebar
50	518,063.45	1,808,621.11	1668.99	spike

NOTES:

- date of survey, November 2002
- horizontal control – Washington state plane coordinate system north zone nad 83 based on gps observation from ngs station "f 378"
- vertical control – north American vertical datum of 1988 based on gps observation from ngs station f 378 elevation 1752.83

LEGEND

- 6' Chain link fence
- Approximate construction ROW boundary
- Approximate permanent ROW boundary
- Approximate existing permanent ROW boundary
- Approximate property boundary

Washington State Div. of Aeronautics
Washington State Dept. of Lands
36" wide gate
CP #2
70'±
12"ø tree to be removed
Trashrack and walkway (–326)
CP #1
6' chain link fence
Existing fish screen structure and fence to be removed
Estimated "High water line"
Existing Headworks
Existing diversion dam
Fishscreen structure (–312)
Check structure (–327)
Existing Fish Ladder
Approximate limits of existing permanent ROW
Approximate limits of permanent ROW
Existing fish return pipe. Cap each end and abandon in place.
Approximate limits of staging area
Fish return inlet structure (–312)
14' wide double gate
6' chain link fence
Methow River flow
Estimated existing contour lines (typ.)
Approximate limits of existing access road
Fish return pipe (–307)
Approximate property corner
Washington State Div. of Aeronautics
Fish return outlet structure (–307)
CP #50
Merutka (private)
Approximate limits of permanent ROW
Approximate limits of construction ROW
Merutka (private)
Washington State Dept. of Lands
50.00'
40.00'
100.00'
60.00'
20.00'
50.00'
E1808300
N518300
E1808700
N518300
N518200
E1808400
N518100
E1808600
N518100
1655
1660
1665
1670
1675
1680
SCALE OF FEET 20 0 20 40 60

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

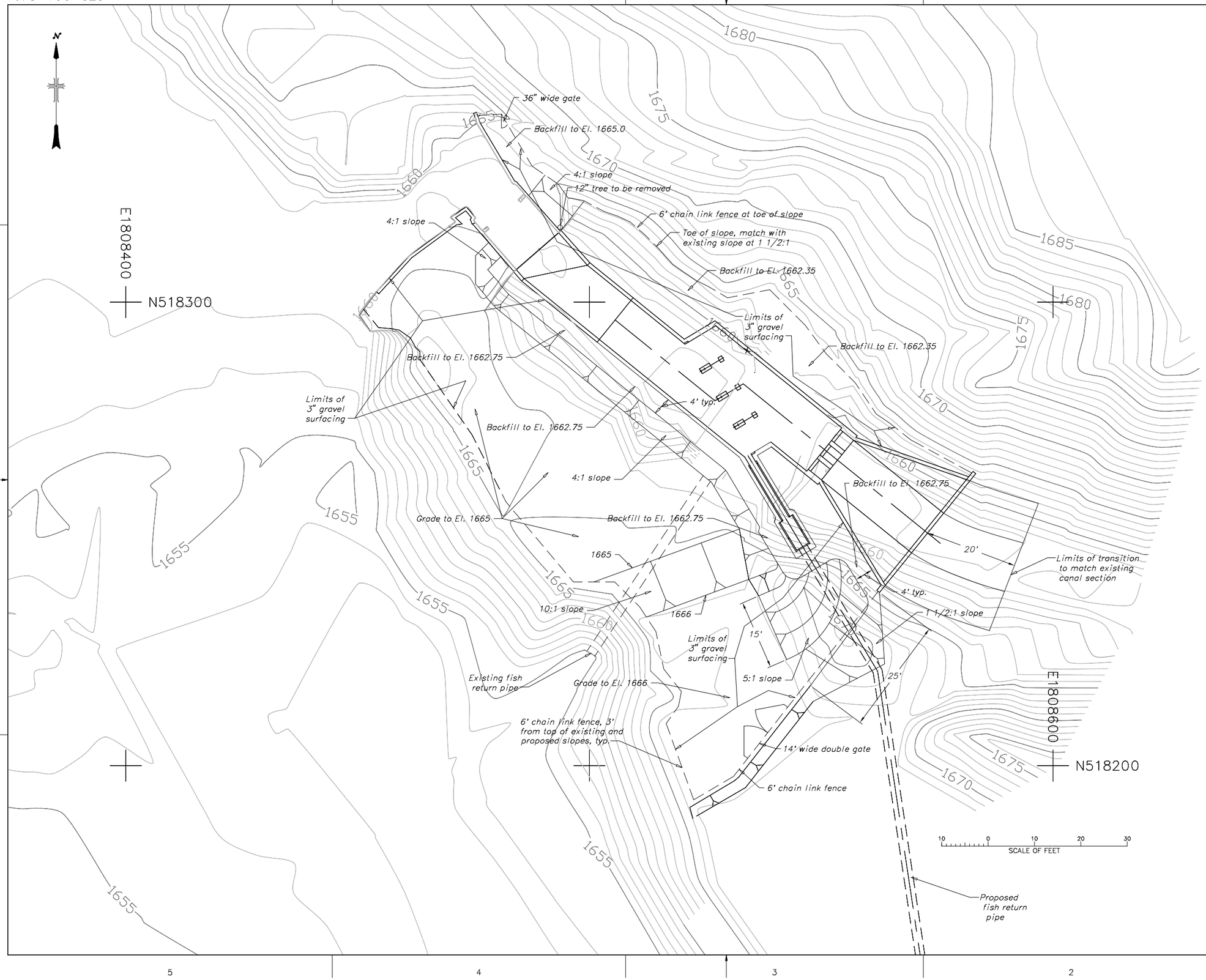
MVID EAST DIVERSION
FISHSCREEN STRUCTURE
SITE PLAN

DESIGNED _____ CHECKED _____
DRAWN Ed Mordhorst/G. Hope TECH. APPROVAL _____
PROGRAM MANAGER

CADD SYSTEM AutoCAD Rel. 15.06 BOISE, IDAHO
CADD FILENAME 1678-100-324.DWG 23 JULY 2003
1678-100-324
SPECIFICATION #

SEPTEMBER 3, 2003 11:30
PLOTTED BY RODRZYCA

1678-100-323



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BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID EAST DIVERSION

FISHSCREEN STRUCTURE

GRADING PLAN

DESIGNED _____ CHECKED _____

DRAWN _____ TECH. APPROVAL _____

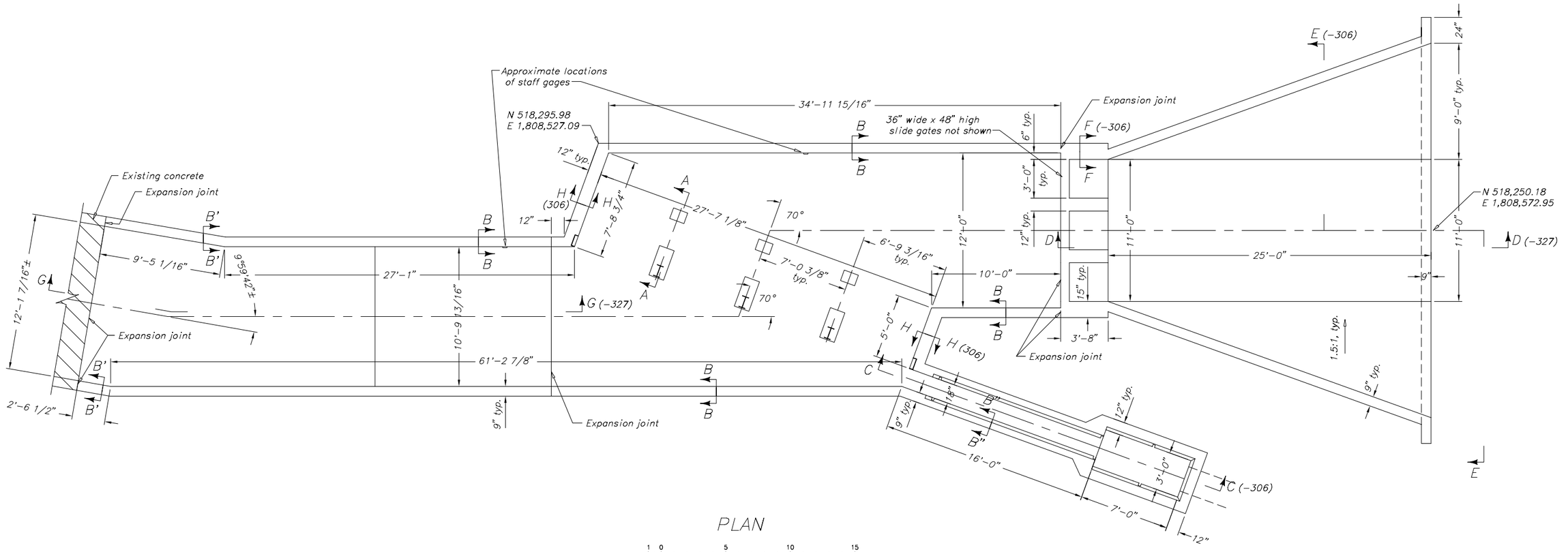
PROGRAM MANAGER

CADD SYSTEM AutoCAD Rel. 15.06 BOISE, IDAHO	CADD FILENAME 1678-100-323.DWG 21 JULY 2003

1678-100-323

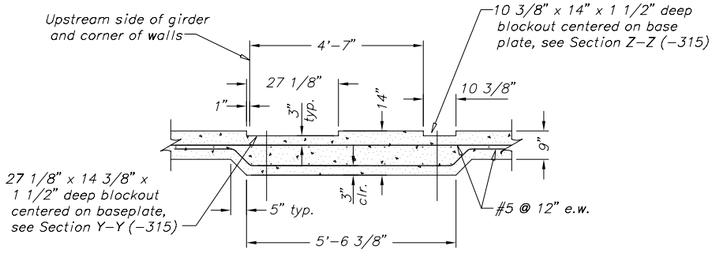
SPECIFICATION #

SEPTEMBER 3, 2003 11:00
PLOTTED BY
RDORCZYCA

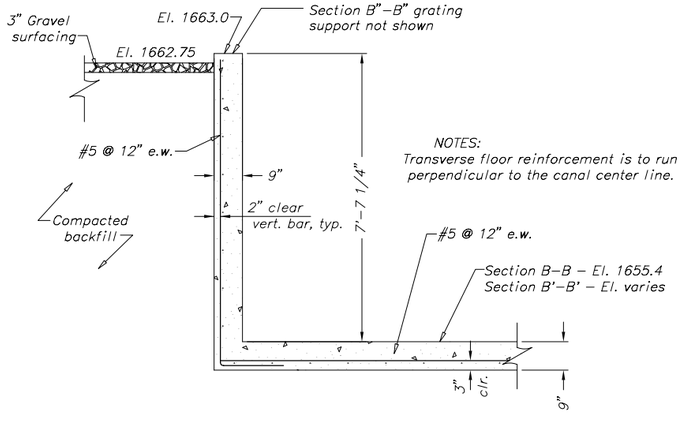


PLAN

1 0 5 10 15
SCALE OF FEET



SECTION A-A



SECTION B-B
(Section B'-B' similar)
(Section B"-B" similar)

1 0 1 2 3 4 5
SCALE OF FEET

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID EAST DIVERSION

FISH SCREEN STRUCTURE

CONCRETE - PLAN AND SECTIONS

DESIGNED _____ CHECKED _____

DRAWN Ed Mordhorst TECH. APPROVAL _____

PROGRAM MANAGER

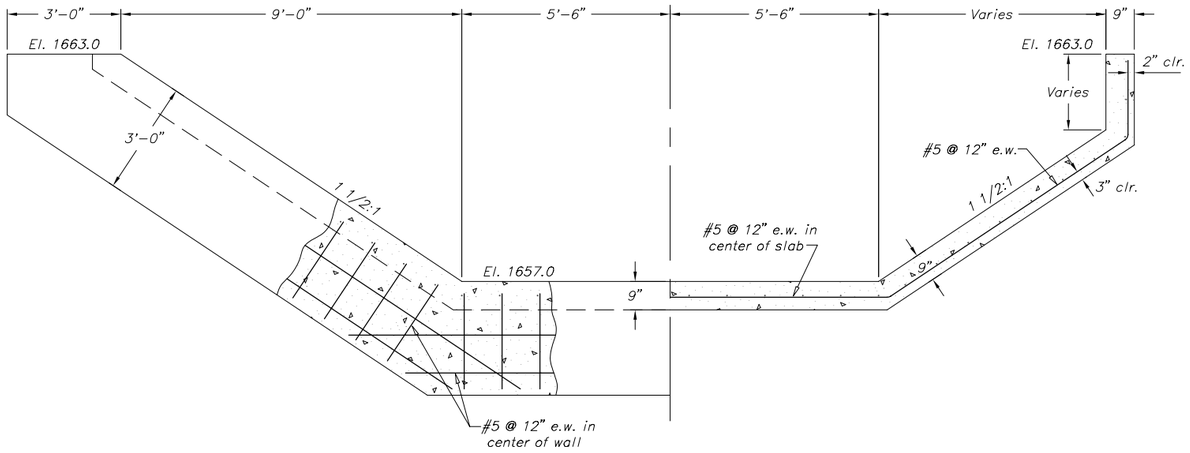
CADD SYSTEM AutoCAD Rel. 15.06
BOISE, IDAHO

CADD FILENAME 1678-100-312.DWG
8 JULY 2003

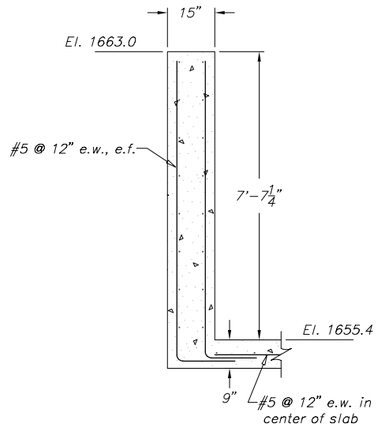
1678-100-312

SPECIFICATION #

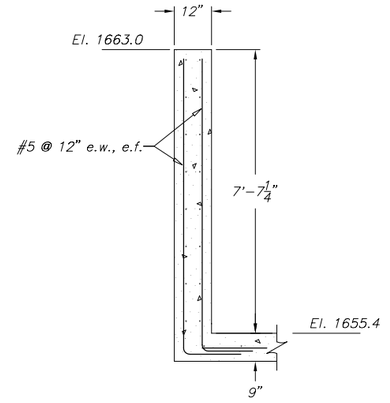
SEPTEMBER 3, 2003 11:38
PLOTTED BY RODRIZTCA



SECTION E-E
(-312)

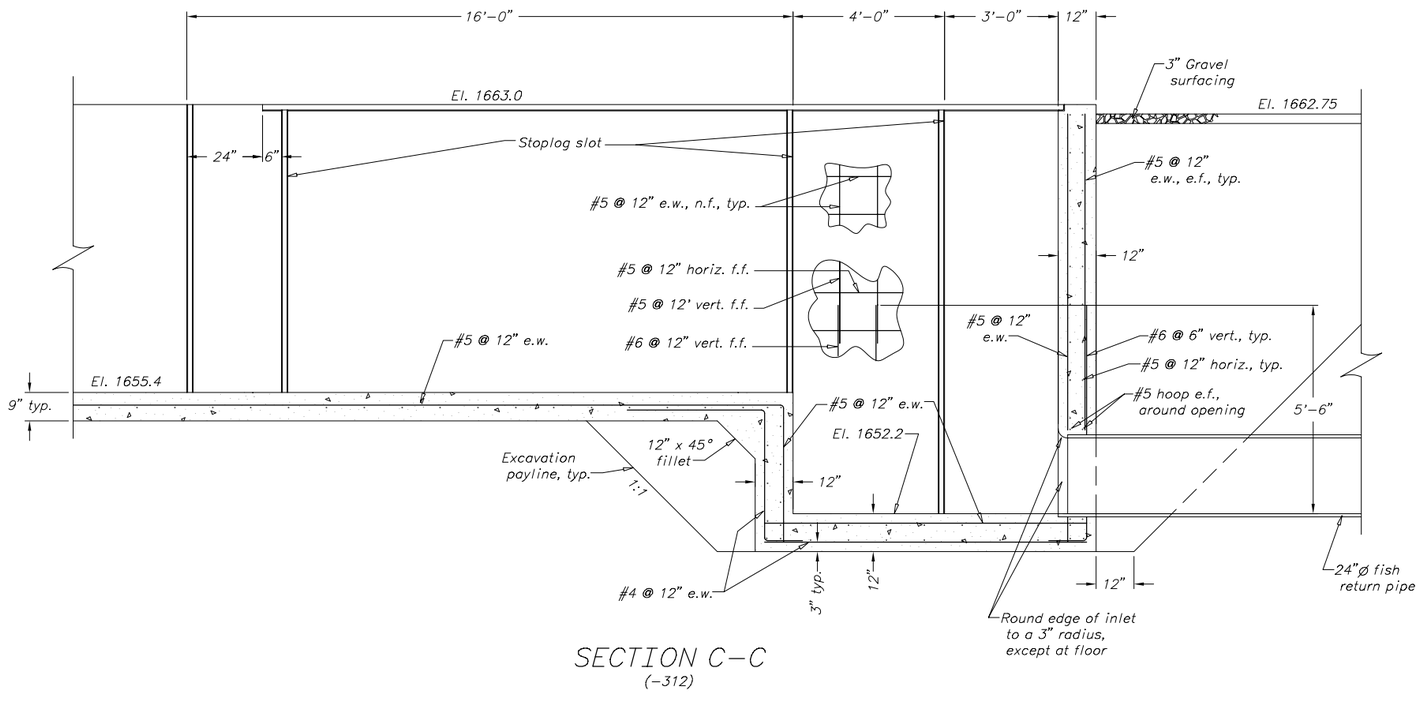


SECTION F-F
(-312)



SECTION H-H
(-312)

1 0 1 2 3 4 5
SCALE OF FEET



SECTION C-C
(-312)

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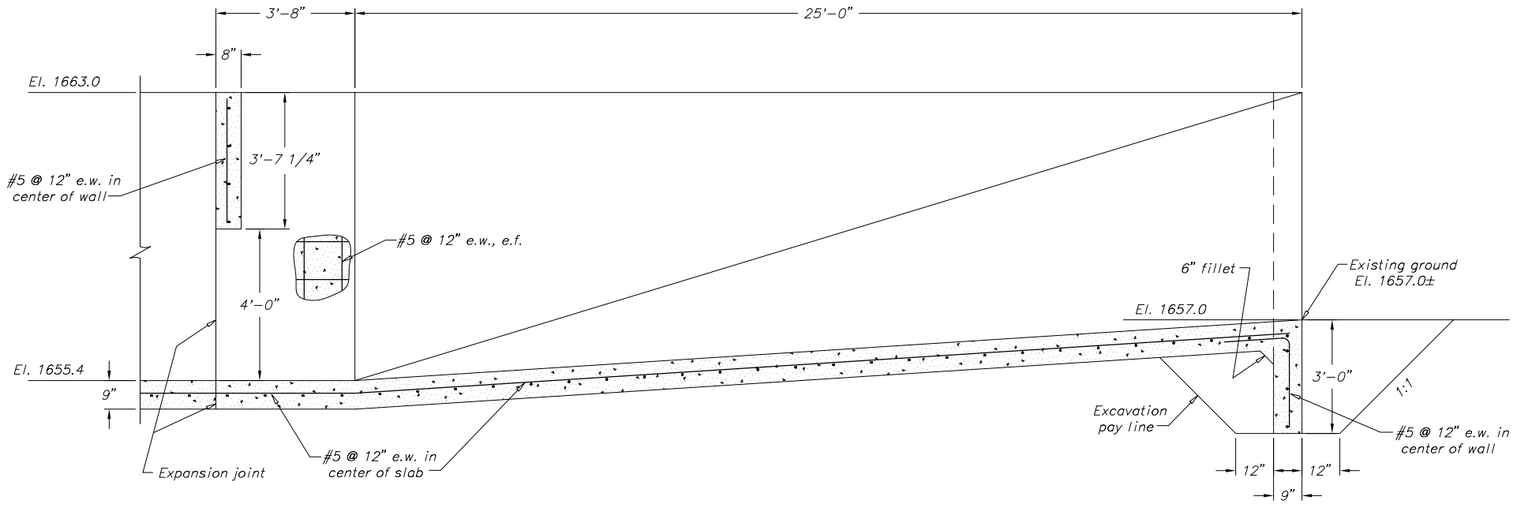
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID EAST DIVERSION
FISH SCREEN STRUCTURE
CONCRETE SECTIONS

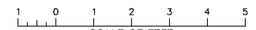
DESIGNED _____ CHECKED _____
DRAWN Ed Mordhorst TECH. APPROVAL _____
PROGRAM MANAGER

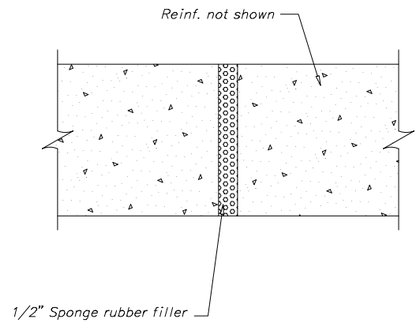
CADD SYSTEM AutoCAD Rel. 15.06
CADD FILENAME 1678-100-306.DWG
BOISE, IDAHO 27 JUNE 2003
1678-100-306
SPECIFICATION #

SEPTEMBER 3, 2003 11:37
PLOTTED BY
RGOREZYCA

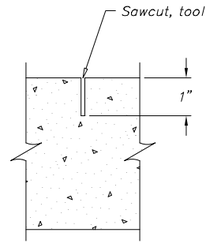


SECTION D-D
(-312)

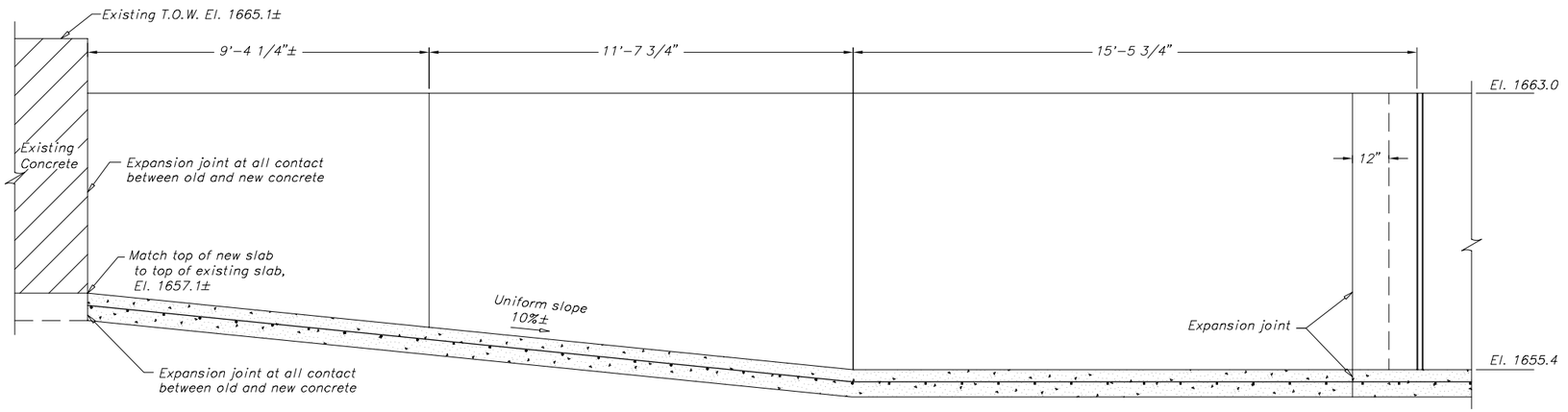




TYPICAL EXPANSION JOINT



TYPICAL CONTRACTION JOINT



SECTION G-G
(-312)

NOTE:
Transverse construction or contraction joint @10' max. spacing in walls and floors between expansion joints, in section G-G only

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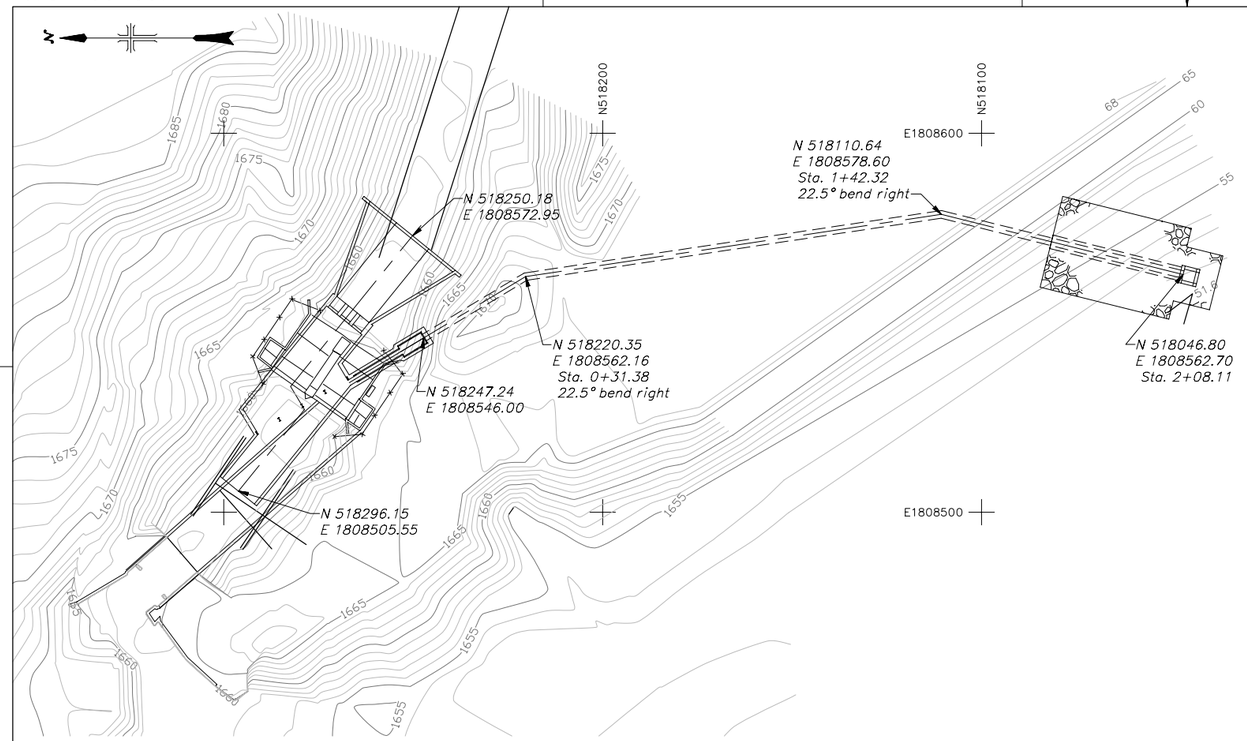
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID EAST DIVERSION
FISHSCREEN STRUCTURE
CONCRETE SECTIONS AND DETAILS

DESIGNED _____ CHECKED _____
DRAWN Ed Mordhorst TECH. APPROVAL _____
PROGRAM MANAGER

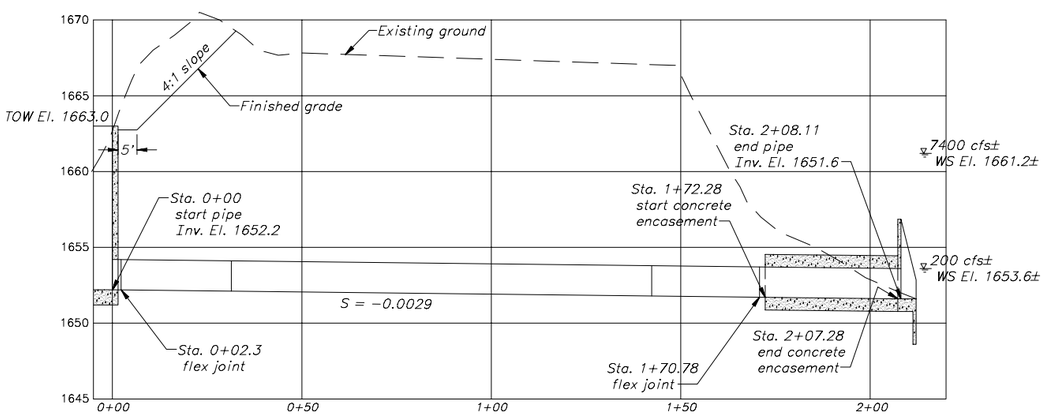
CADD SYSTEM AutoCAD Rel. 15.06
CADD FILENAME 1678-100-327.DWG
BOISE, IDAHO 29 JULY 2003
1678-100-327
SPECIFICATION #

SEPTEMBER 3, 2003 11:39
PLOTTED BY
RODRCZYCA

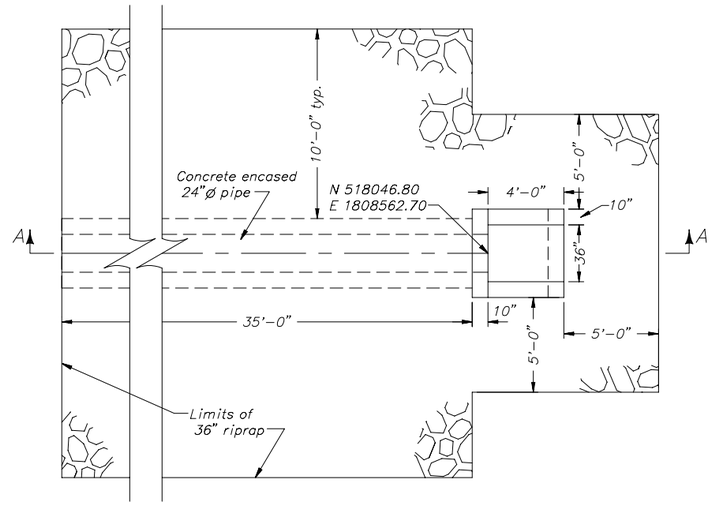


SITE PLAN

20 0 20 40 60
SCALE OF FEET

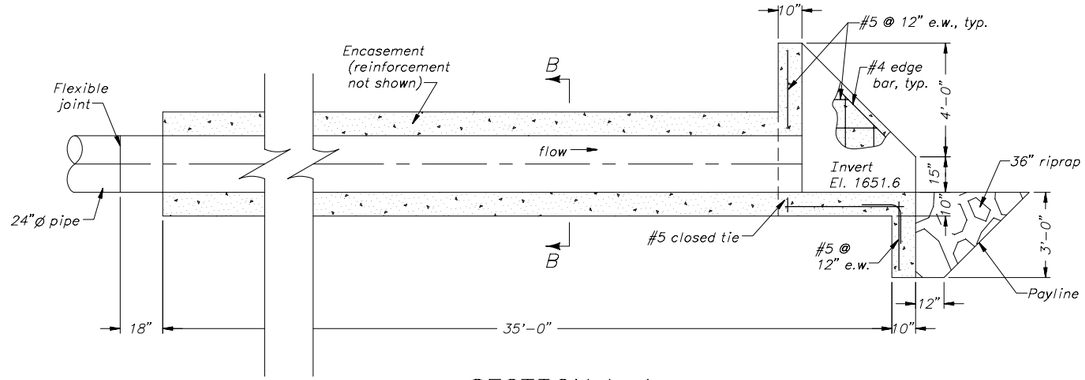


FISH RETURN PIPE – PROFILE



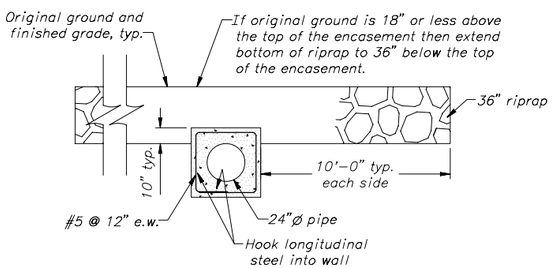
FISH RETURN OUTLET STRUCTURE PLAN

1 0 5 10 15
SCALE OF FEET



SECTION A–A

1 0 1 2 3 4 5 6 7 8
SCALE OF FEET



SECTION B–B

1 0 5 10 15
SCALE OF FEET

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID EAST DIVERSION

FISHSCREEN
FISH RETURN PIPE
PLAN, PROFILE, AND SECTIONS

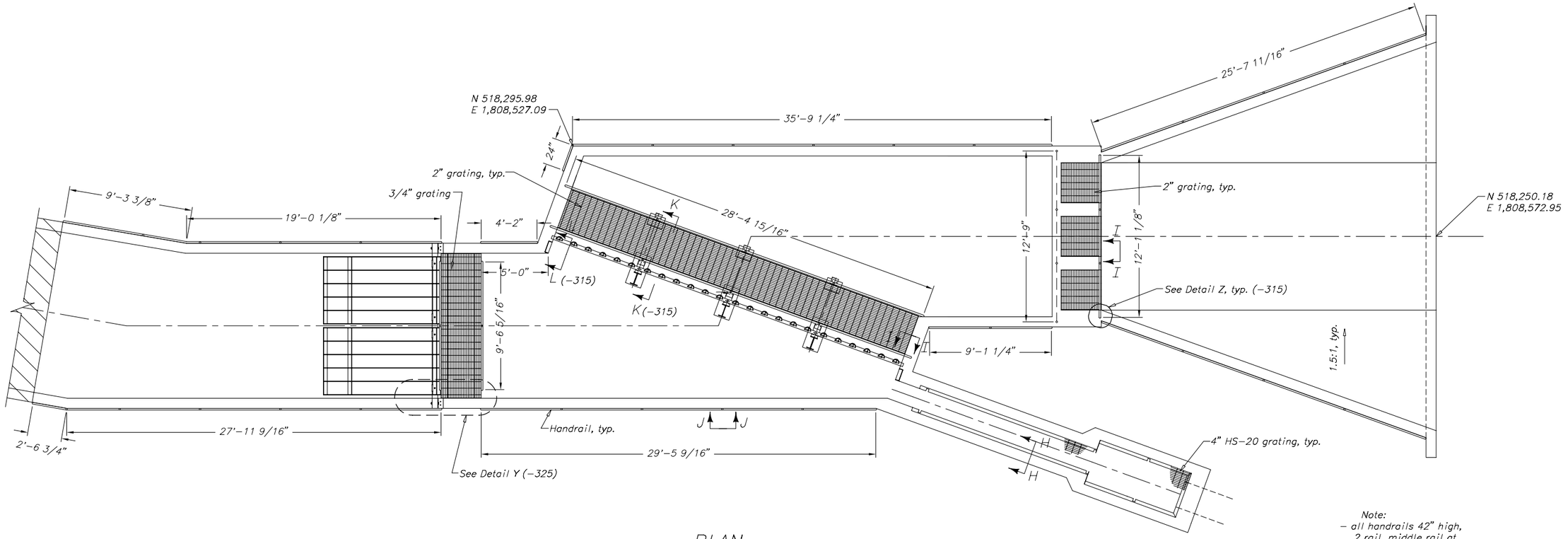
DESIGNED _____ CHECKED _____
DRAWN Ed Mordhorst TECH. APPROVAL _____
PROGRAM MANAGER

CADD SYSTEM AutoCAD Rel. 15.06	CADD FILENAME 1678-100-307.DWG
BOISE, IDAHO	9 JULY 2003

1678-100-307

SPECIFICATION #

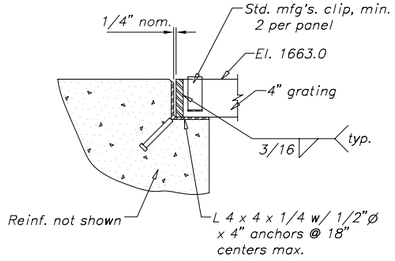
SEPTEMBER 3, 2003 12:00
PLOTTED BY
RDORCZYCA



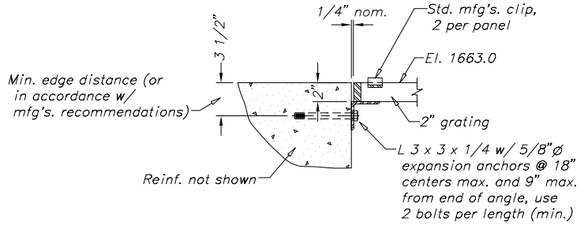
PLAN

1 0 5 10 15
SCALE OF FEET

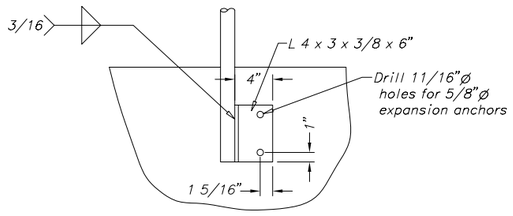
Note:
– all handrails 42" high, 2 rail, middle rail at 21" high, 8 foot max. post spacing.



SECTION H-H



SECTION I-I



Note:
Handrail post to be flush with edge of concrete

SECTION J-J

1 0 1 2
SCALE OF FEET

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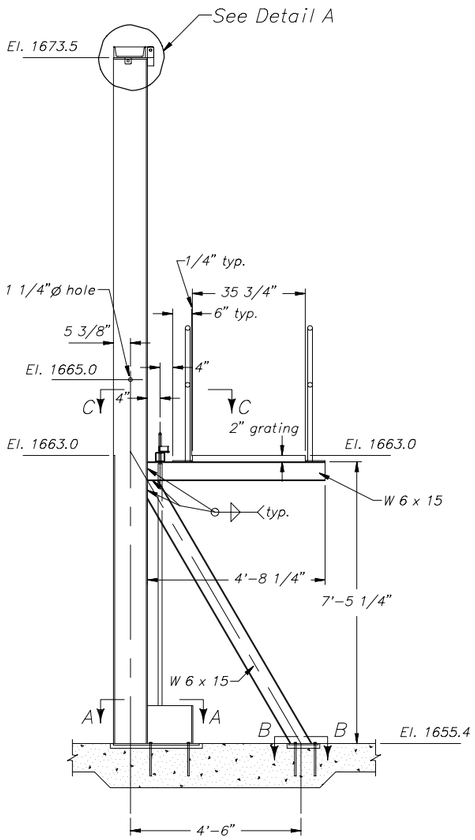
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID EAST DIVERSION
FISH SCREEN STRUCTURE
METALWORK – PLAN AND SECTIONS

DESIGNED _____ CHECKED _____
DRAWN Ed Mordhorst TECH. APPROVAL _____
PROGRAM MANAGER

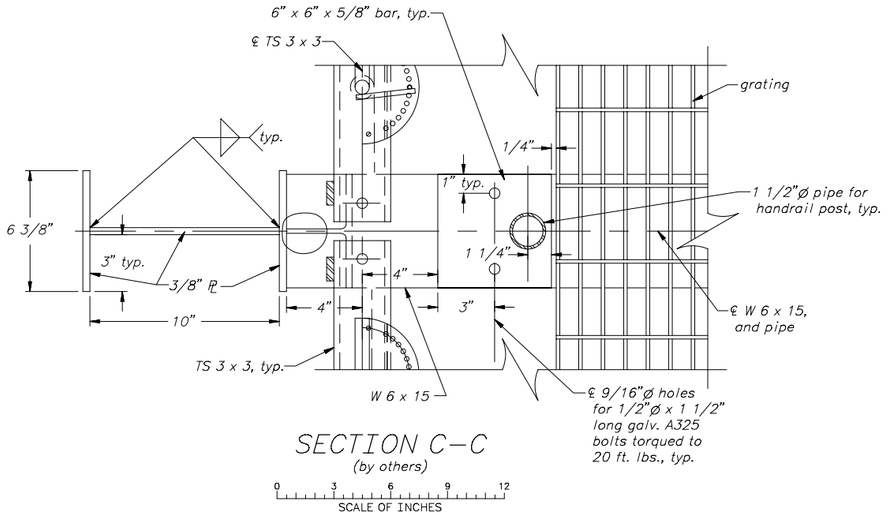
CADD SYSTEM AutoCAD Rel. 15.06
CADD FILENAME 1678-100-326.DWG
BOISE, IDAHO 22 JULY 2003 1678-100-326
SPECIFICATION #

SETTLEMENT 3, 2003 12:01
PLOTTED BY RDORCZYCA



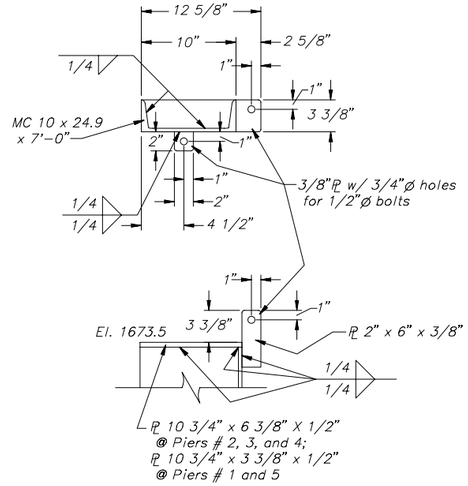
SECTION K-K
(-326)
(Typical Section, Piers 2, 3, & 4)
(by others except for blockouts and reinforced concrete)

SCALE OF FEET: 1 0 1 2 3 4 5

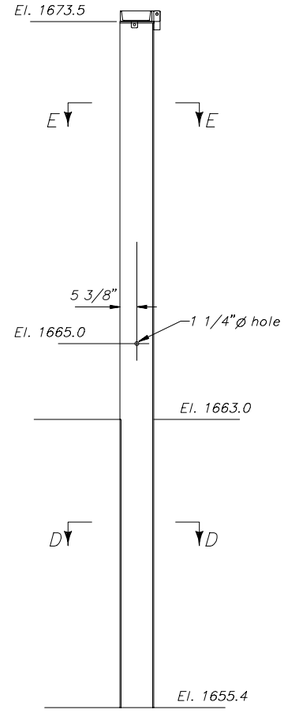


SECTION C-C
(by others)

SCALE OF INCHES: 0 3 6 9 12

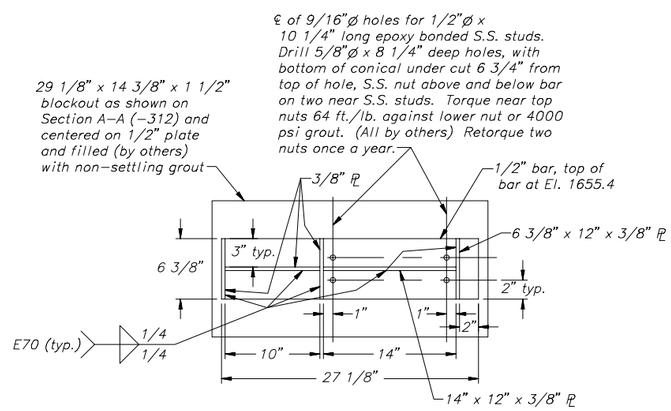


DETAIL A
(by others)
(Exploded)



SECTION L-L
(-326)
(Piers 1 and 5, Typical Section)
(Pier 5 shown, Pier 1 opposite hand)

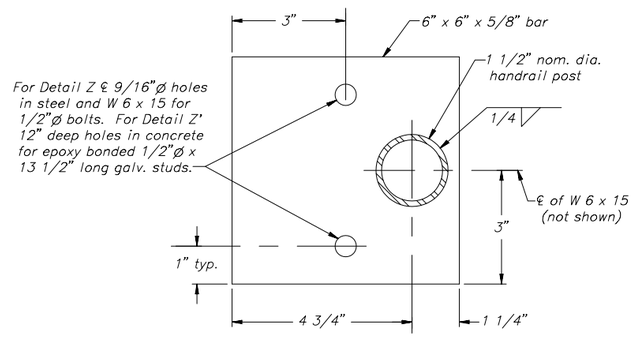
SCALE OF FEET: 1 0 1 2 3 4 5



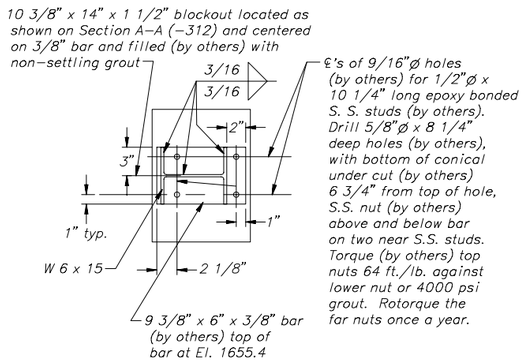
SECTION A-A
(by others except for blockouts & reinforced concrete)

SCALE OF FEET: 1 0 1 2

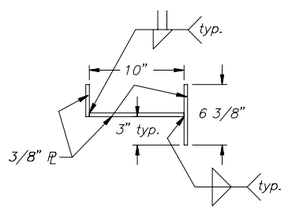
SECTION D-D



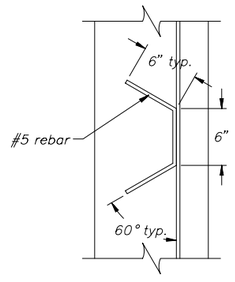
DETAIL Z
(-326)
(by others)



SECTION B-B
(by others except for blockouts & reinforced concrete)



SECTION E-E



SECTION F-F

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID EAST DIVERSION
FISHSCREEN STRUCTURE
METALWORK - SECTIONS AND DETAILS

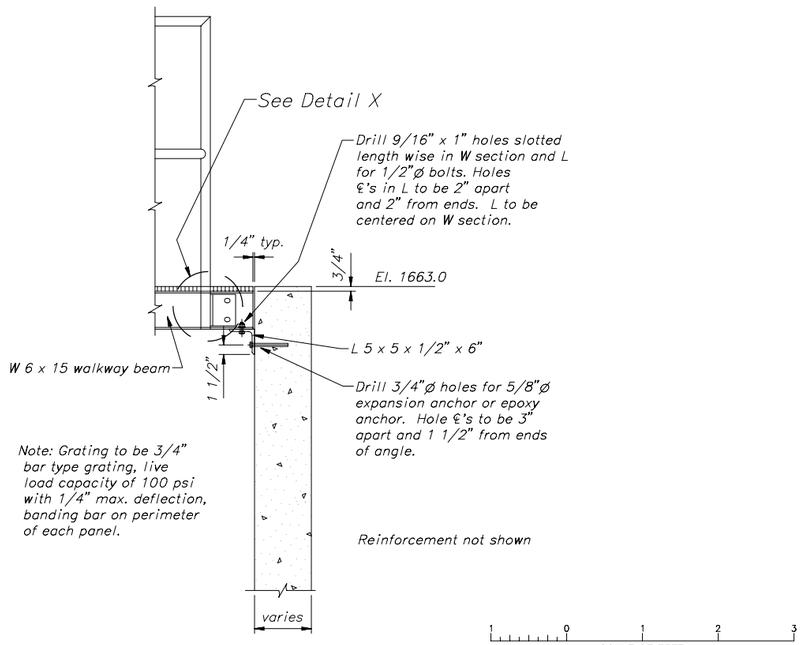
DESIGNED _____ CHECKED _____
DRAWN _____ TECH. APPROVAL _____
PROGRAM MANAGER

CADD SYSTEM: AutoCAD Rel. 15.06
BOISE, IDAHO
CADD FILENAME: 1678-100-315.DWG
17 JULY 2003

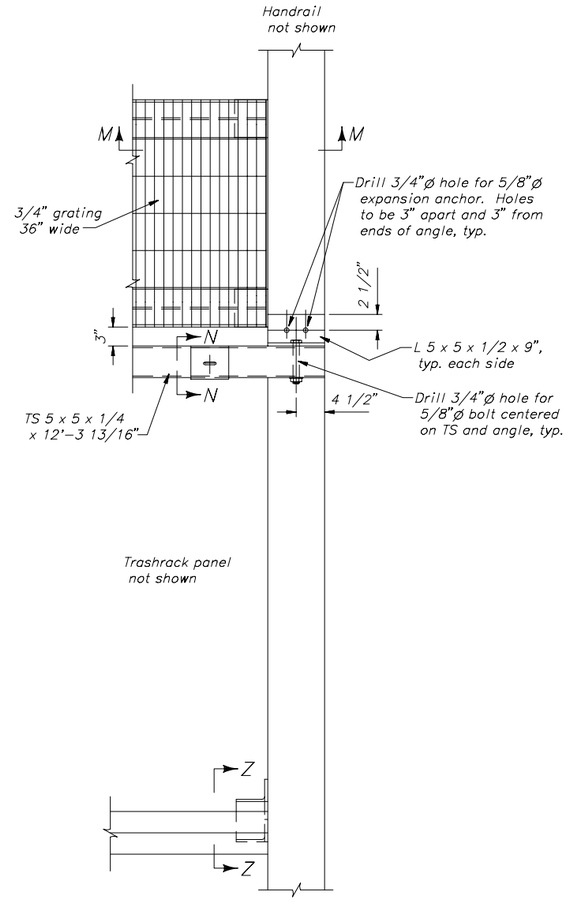
1678-100-315

SPECIFICATION #

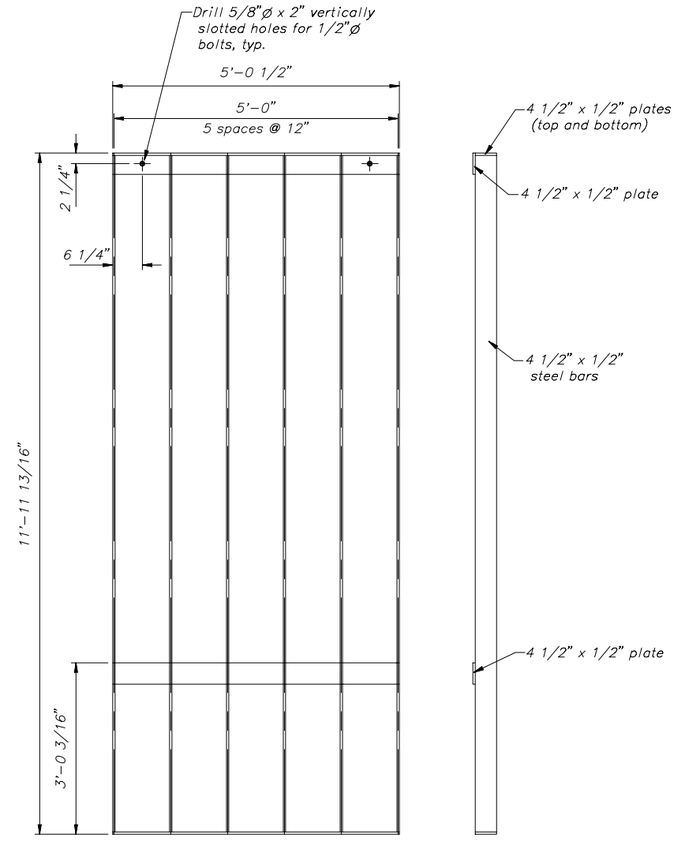
SEPTEMBER 3, 2003 12:04
PLOTTED BY RODRIGUEZCA



SECTION M-M



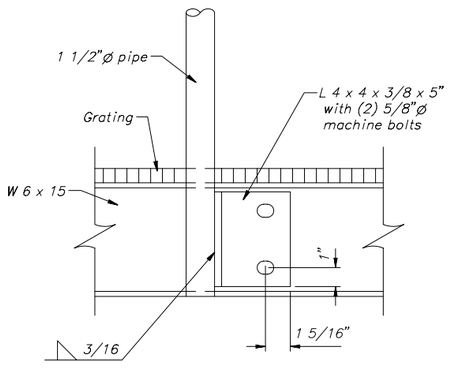
DETAIL Y
(-326)



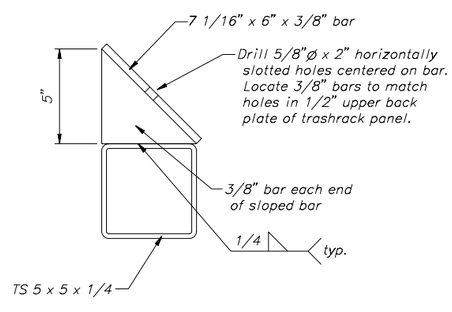
NOTES:
1. Full length, both sides, 1/4" fillet welds at all joints.
2. Diagonal measurements for each panel to be within 1/4".
3. Install panels to provide equal spacing at walls and between panels.

TRASHRACK PANEL - ELEVATION
(2 Required)

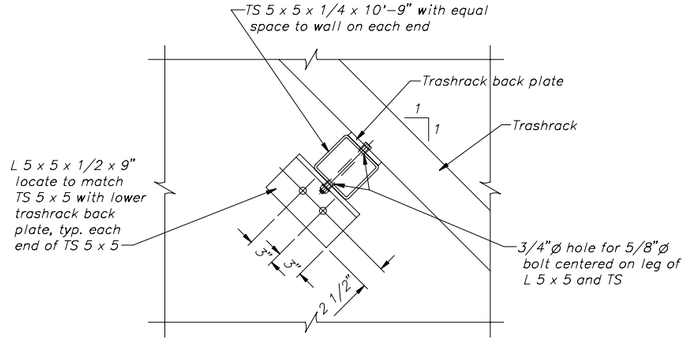
1 0 1 2 3 4 5
SCALE OF FEET



DETAIL X



SECTION N-N



SECTION Z-Z

0 3 6 9 12
SCALE OF INCHES

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

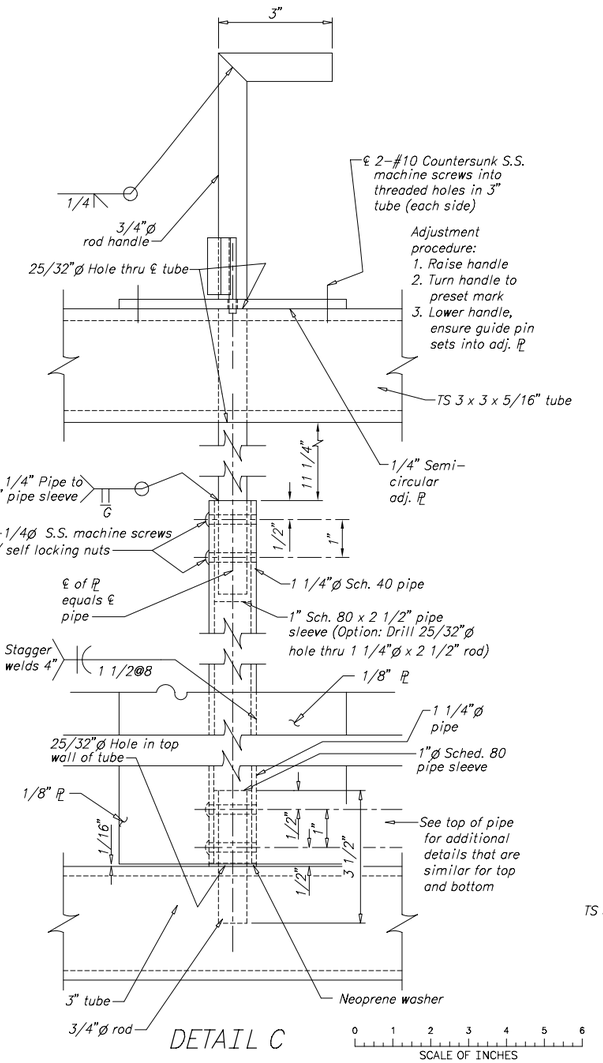
MVID EAST DIVERSION
FISHSCREEN STRUCTURE
METALWORK
TRASHRACK SECTIONS, ELEVATION, AND DETAILS

DESIGNED _____ CHECKED _____
DRAWN _____ TECH. APPROVAL _____
PROGRAM MANAGER

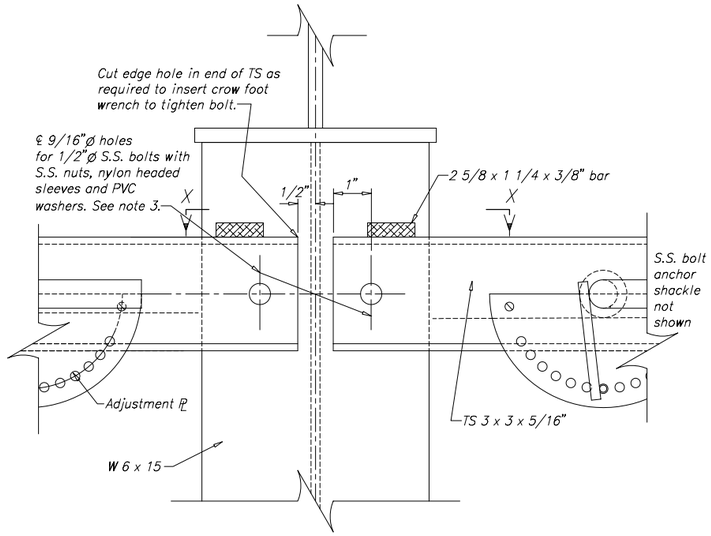
CADD SYSTEM: AutoCAD Rel. 15.06
CADD FILENAME: 1678-100-325.DWG
BOISE, IDAHO — 23 JULY 2003 — 1678-100-325

SPECIFICATION #

SEPTEMBER 3, 2003 12:03
PLOTTED BY
RODRCZYCA

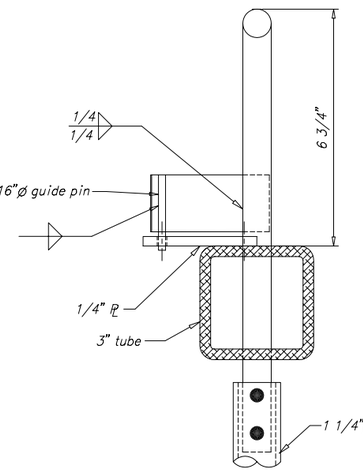


DETAIL C



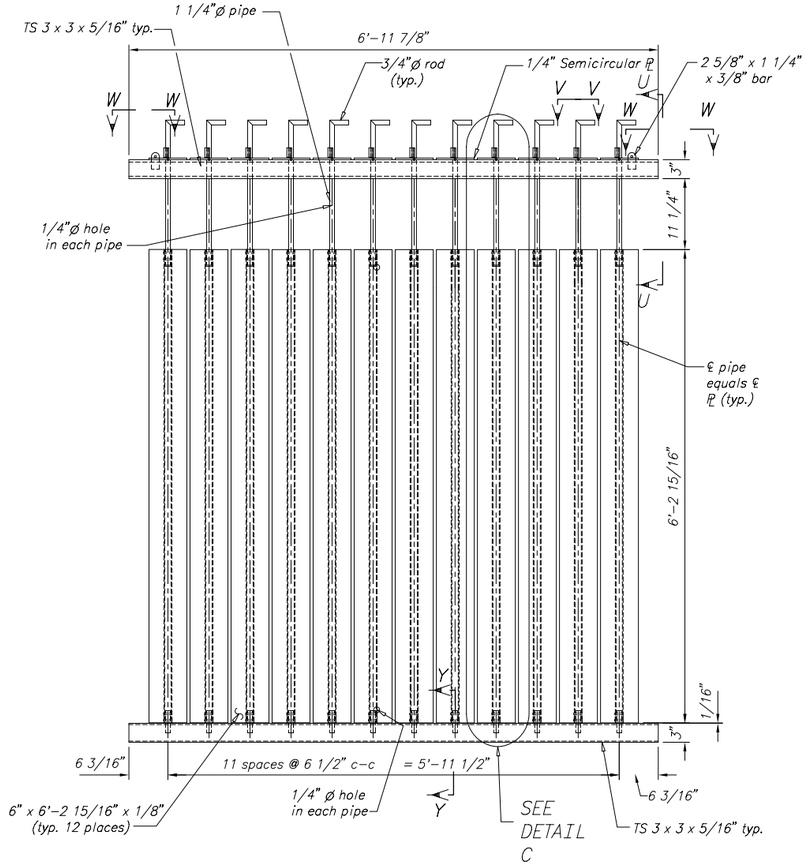
SECTION W-W
(Shown in Installed Position)

0 1 2 3 4 5 6
SCALE OF INCHES



SECTION U-U

1 0 1 2 3 4 5
SCALE OF FEET



BAFFLE (4 REQ'D.)

Elevation-looking at upstream face

1 0 1 2 3
SCALE OF FEET

SECTION Y-Y

SECTION X-X

SECTION V-V

1 0 1 2 3 4 5
SCALE OF FEET

Notes:

1. Pipe diameters are nominal diameters.
2. Baffles are made of aluminum except where otherwise shown. Aluminum shall be 6063-T6.

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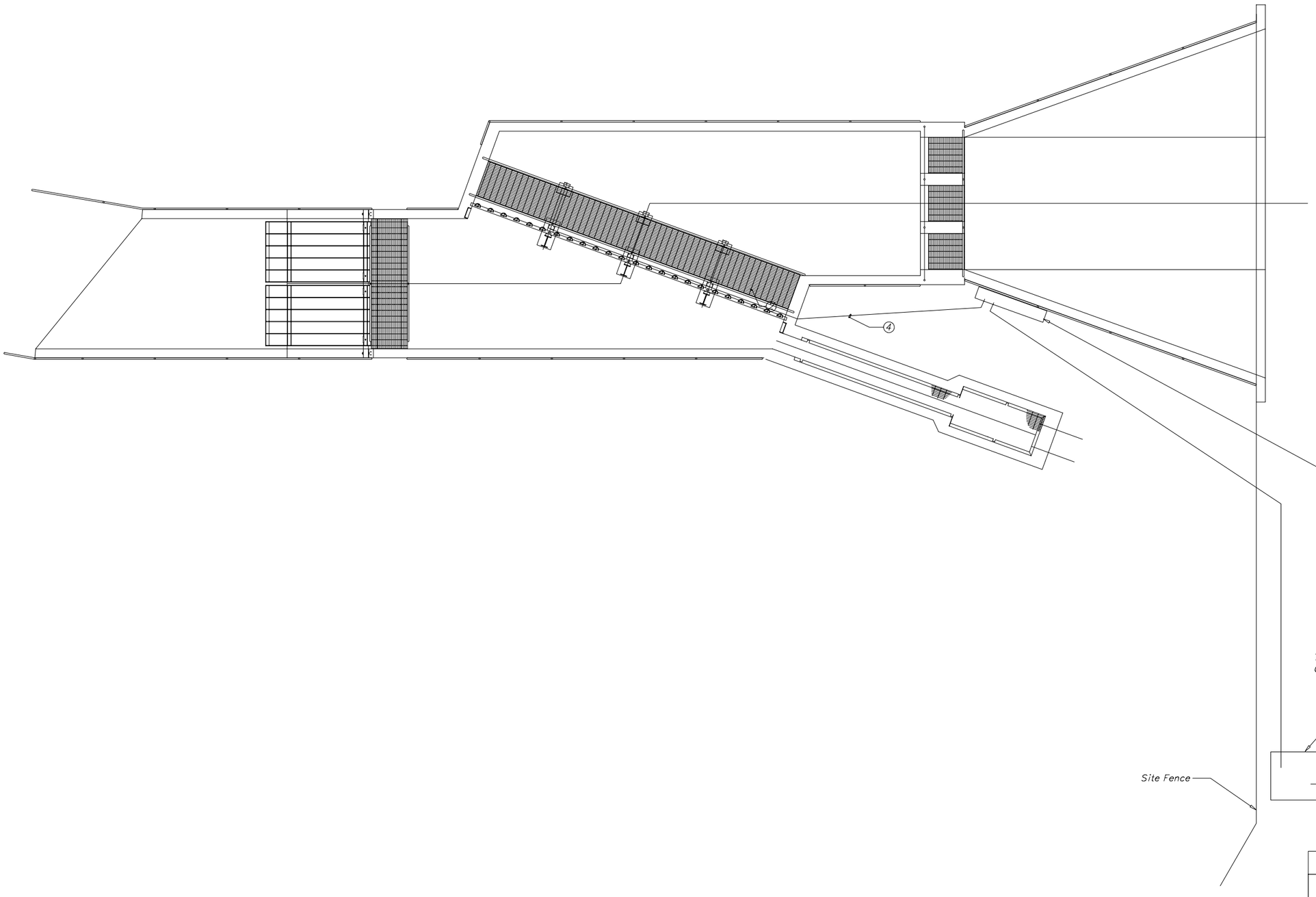
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM
MVID EAST DIVERSION

FISHSCREEN
METALWORK
BAFFLE ELEVATION, SECTIONS & DETAIL

DESIGNED _____ CHECKED _____
DRAWN Ed Mordhorst TECH. APPROVAL _____
PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AutoCAD Rel. 15.06	1678-100-314.DWG	SEPTEMBER 3, 2003 12:05
BOISE, IDAHO	14 JULY 2003	1678-100-314



Notes:

1. *Conduit No. 1 shall contain pull rope for utility installed cable.*
2. *See Drawing xxxx for motor receptacle location / detail.*
3. *See drawing 1678-100-331 for conduit 1-7 details*

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DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID EAST DIVERSION

FISHSCREEN STRUCTURE

ELECTRICAL SITE PLAN

DESIGNED _____ CHECKED _____

DRAWN Ed Mordhorst TECH. APPROVAL _____

PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME
AutoCAD Rel. 15.06	1678-100-329.DWG
BOISE, IDAHO 23 JULY 2003	1678-100-329

SPECIFICATION #

SEPTEMBER 3, 2003 12:08
PLOTTED BY
RGORCZYCA

Panel No. : MVID PPM	Section :	BUS: 240/120 Volts	☒ Main Ckt. Breaker 100 AMP
Location : MVID – East	Serving : Fishscreen	1 PH 3 WIRE 125 AMP	☐ Main Lugs Only
Fully Rated SCI 10,000 RMS SYS AMPS	☐ Feed Through Lugs ☐ SubFeed Lugs	☐ Isolated Ground Bus	☐ Flush Mount ☒ Surface Mount ☐ Top Feed ☒ Bottom Feed

LOAD TYPE	CIRCUIT DESCRIPTION	CONN VA	C.B. AMP	C.B. POLE	CKT	PH	C.B. CKT	C.B. POLE	C.B. AMP	CONN VA	CIRCUIT DESCRIPTION	LOAD TYPE
M	SCREEN MOTOR	741	20	2	1	N/A	2	2	20	741	SCREEN MOTOR	M
M	——— II ———	741	20	2	3	N/A	4	2	20	741	——— II ———	M
M	SCREEN MOTOR	741	20	2	5	N/A	6	2	20	741	SCREEN MOTOR	M
M	——— II ———	741	20	2	7	N/A	8	2	20	741	——— II ———	M
R	GENERAL RECEPTACLE	1800	20	1	9	N/A	10	1	20	1920	SPARE	
	SPARE	1920	20	1	11	N/A	12	1	20	1920	SPARE	
	SPARE	1920	20	1	13	N/A	14	1	20	1920	SPARE	
	Space				15	N/A	16				Space	
	Space				17	N/A	18				Space	
	Space				19	N/A	20				Space	
	Space				21	N/A	22				Space	
	Space				23	N/A	24				Space	
	Space				25	N/A	26				Space	
	Space				27	N/A	28				Space	
	Space				29	N/A	30				Space	
	Space				31	N/A	32				Space	
	Space				33	N/A	34				Space	
	Space				35	N/A	36				Space	
	Space				37	N/A	38				Space	
	Space				39	N/A	40				Space	
	Space				41	N/A	42				Space	

Total Receptacle (R) Load @ 180VA/each=>100% for first 10KVA & 50% for remainder: kVA

Total Non-coincidental (E) Load: kVA

Total Lighting (L) Load @ 125% : kVA

Total Motor (M) Load : kVA

Total Heating (H) Load : kVA

Total Non-continuous (N) Load : kVA

Largest Motor (25% added to demand load): HP kVA

TOTAL CONNECTED LOAD : kVA	CONNECTED AMP Total Amp / PH :	A	B	C	TOTAL DEMAND LOAD AMP kVA

Notes:
1. Field verify panel mounting location.

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID – EAST FISHSCREEN

ELECTRICAL INSTALLATION

PANEL SCHEDULE

DESIGNED _____ CHECKED _____

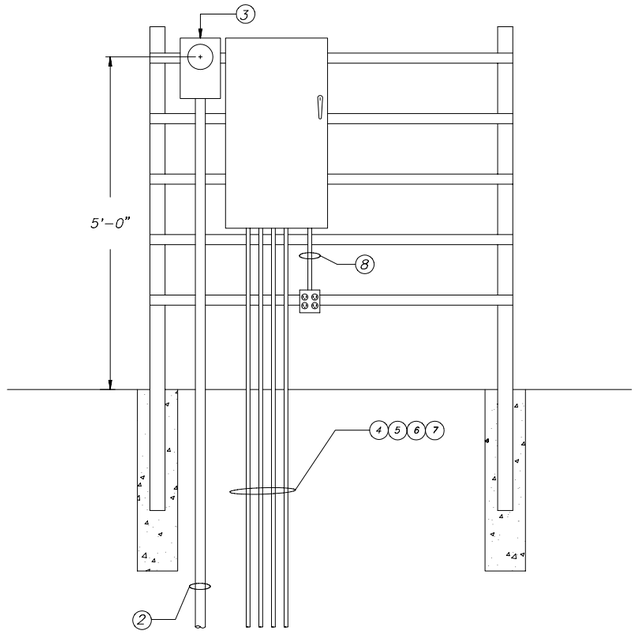
DRAWN _____ TECH. APPROVAL _____

PROGRAM MANAGER

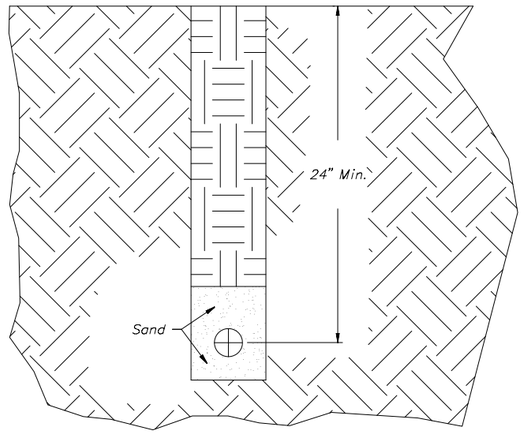
CADD SYSTEM	CADD FILENAME
BOISE, IDAHO	6 AUGUST 2003 | 1678-100-330

PLOTTED BY

Notes:
1. Conduit No. 1 Shown on Electrical Site Plan.
2. Field Verify Panel Mounting Location.



METER BASE / PANEL DETAIL



CONDUIT/ TRENCH DETAIL

CONDUIT & CABLE SCHEDULE

Conduit No.	Cable	Conduit Size	From	To	Remarks
1	(BY OTHERS)	2"	UTILITY SPLICE	UTILITY XFMR	UTILITY INSTALLED CABLE
2	3-1C No. 2	2"	UTILITY XFMR	METER BASE	BURRIED/SURFACE MOUNT
3	4-1C No. 2	2"	METER BASE	PANEL	NIPPLE
4	4-1C No. 12	3/4"	PANEL	MOTOR 1	EMBEDDED/BURRIED/SURFACE
5	4-1C No. 12	3/4"	PANEL	MOTOR 2	EMBEDDED/BURRIED/SURFACE
6	4-1C No. 12	3/4"	PANEL	MOTOR 3	EMBEDDED/BURRIED/SURFACE
7	4-1C No. 12	3/4"	PANEL	MOTOR 4	EMBEDDED/BURRIED/SURFACE
8	3-1C No. 12	3/4"	PANEL	RECEPTACLES	SURFACE

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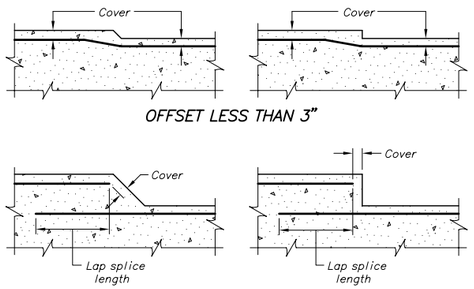
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID - EAST FISHSCREEN
ELECTRICAL INSTALLATION
CONDUIT SCHEDULE & DETAILS

DESIGNED _____ CHECKED _____
DRAWN _____ TECH. APPROVAL _____
APPROVAL _____
PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
BOISE, IDAHO	MARCH 2002	1678-100-331



OFFSET LESS THAN 3"

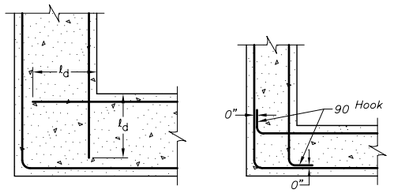
OFFSET 3" TO 8"

NOTE TO DESIGNERS AND DETAILERS: This detail may not be appropriate for tension areas of shallow structural members. If in doubt, use detail for offset greater than 8". See limits for noncontact lap splices in General Notes, Splices.

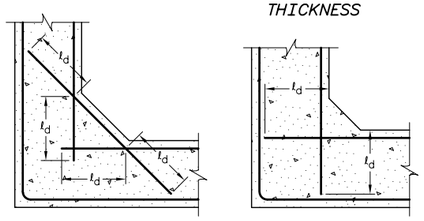
OFFSET GREATER THAN 8"

OFFSET GREATER THAN 8"
RESTRICTED MEMBER THICKNESS

TYPICAL OFFSET DETAILS



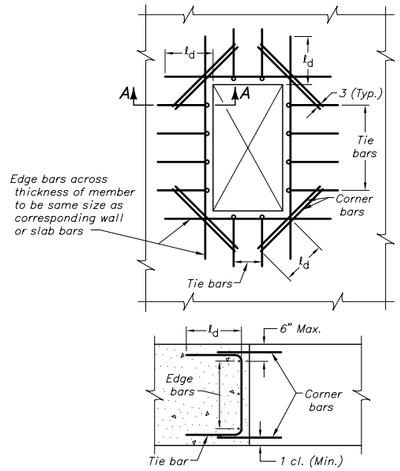
RESTRICTED MEMBER THICKNESS



FILLET 1'-0" OR GREATER

FILLET LESS THAN 1'-0"

TYPICAL CORNER DETAILS



SECTION A-A

OPENINGS:

TABLE FOR ADDITIONAL REINFORCEMENT

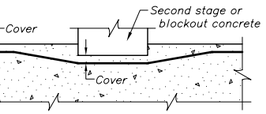
MEMBER THICKNESS	TIE BARS	EDGE BARS	CORNER BARS
Less than 10	None	1 – ctr.	2 – #4 ctr.
10 thru 1-6	None	2 – (1 ef)	4 – #4 (2 ef)
1-7 thru 3-0	#4 @ 1-0	3 – eq. spc.	4 – #4 (2 ef)
Over 3-0	#6 @ 1-0	Spc. @ 1-0	4 – #5 (2 ef)

Omit edge and tie bars along sides of openings where dimension is less than 1'-6".
Omit corner bars at sides of openings adjacent to floors, walls, or beams.
Omit corner bars if both dimensions of opening are less than 1'-6".

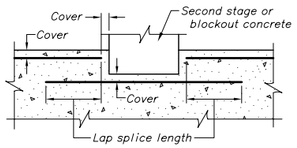
RECESSES:

Use corner bars in face of recesses deeper than 4" if either dimension of recess is equal to or greater than 1'-6".

ADDITIONAL REINFORCEMENT AROUND OPENINGS AND RECESSES

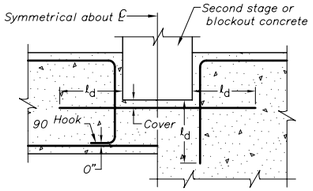


RECESS LESS THAN 3" DEEP



RECESS 3" TO 8" DEEP

NOTE TO DESIGNERS AND DETAILERS: This detail may not be appropriate for tension areas of shallow structural members. If in doubt, use detail for recess greater than 8". See limits for noncontact lap splices in General Notes, Splices.



RECESS GREATER THAN 8"

TYPICAL BLOCKOUT RECESS DETAILS

(Second stage concrete shown)

GENERAL NOTES 1/

UNLESS OTHERWISE SHOWN ON THE REINFORCEMENT DESIGN DRAWINGS, THE DETAILS AND NOTES SHOWN ARE MINIMUM REQUIREMENTS AND TYPICAL FOR ALL REINFORCEMENT DRAWINGS THAT REFER TO THIS DRAWING

ABBREVIATIONS:

bf = bottom face	br = bottom row	bl = bottom layer
tf = top face	tr = top row	tl = top layer
nf = near face	nr = near row	ml = middle layer
ff = far face	fr = far row	ns = near side
ef = each face	er = each row	fs = far side
if = inside face	ir = inside row	es = each side
of = outside face	or = outside row	ew = each way
	mr = middle row	ec = each corner

spc. = space or spaces
eq. spc. = equally spaced, equal spaces
d_b = nominal diameter or reinforcing bar
uv = uniformly varying lengths of bars between lengths shown
cl. = clear
ctr. = center or centers
add'l = additional
t_d = development length

SYMBOLS:

Bars shown thus —#8@1-0 or —#6@8 indicate a group of the same size bars equally spaced.
—○ An open circle at the end of a bar indicates a bend with the bar turned away from the observer.
—● A closed circle at the end of a bar indicates a bend with the bar turned towards the observer.
Splices shown thus —— indicate a lap splice, not a bend in the bar.

DIMENSIONS:

Dimensions are to the centerline of the bars except for embedment of hooks, which are dimensioned to the outside of the bar.
Clear cover dimensions are marked "cl." and are dimensioned to the outside of the bar.

COVER:

Place the reinforcement so that the clear distance between face of concrete and nearest reinforcement is 1½" for #5 bars and smaller, 2" for #6 bars through #8 bars and 3" for #9 bars through #11 bars. Provide 3" clear distance from face of concrete for all bars when the concrete is placed against earth or rock. Clear distance is to the design dimension line.
Reinforcement parallel construction joints shall have a minimum of 2" clear cover.

PLACING:

Reinforcement at small openings (max. 1'-6") in walls and slabs may be spread apart not more than 1.50 times the bar spacing.
Reinforcement may be adjusted laterally to maintain a clear distance of at least 1" between the reinforcement and keys, water stops, anchor bolts, form ties, conduits, and other embedded materials. In heavily reinforced areas, relocation of the embedded material must be considered.
When bars are bent due to offsets less that 3" and recesses less that 3" deep, the slope of the inclined portion must not exceed 6 to 1.
Reinforcement parallel to anchor bolts or other embedded material shall be placed to maintain a clear distance of at least 1.33 times the maximum size aggregate.

SPACING:

The first and last bars in walls and slabs, stirrups in beams, and ties in columns are to start and end at a maximum of one half of the adjacent bar spacing. The minimum edge spacing shall be the smaller of either $2.5d_b$ or 0.5 of the adjacent bar spacing.

STANDARD HOOKS:

1. 180-degree bend plus $4d_b$ extension, but not less than 2½" at the free end of the bar.
2. 90-degree bend plus $12d_b$ extension at free end of the bar.

STIRRUP AND THE HOOKS:

1. #5 bar and smaller, 90-degree bend plus $6d_b$ extension at the free end of the bar.
2. #6, #7, and #8 bars, 90-degree bend plus $12d_b$ extension at the free end of the bar.
3. #8 bars and smaller, 135-degree bend plus $6d_b$ extension at the free end of the bar.

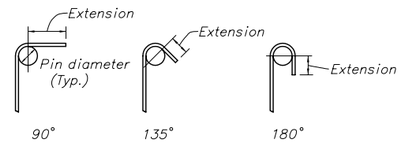


TABLE OF PIN DIAMETERS IN INCHES

BAR NO.	3	4	5	6	7	8	9	10	11
Standard bends	2 ¼	3	3 ¾	4 ½	5 ¼	6	9 ½	10 ¾	12
Stirrup and tie bends	1 ½	2	2 ½	4 ½	5 ¼	6			

REINFORCEMENT DOWELS:

Dowels indicated on the drawing, such as #8(d), shall be embedded a length equal to t_d and shall have a projection equal to that required for lap splicing to a bar of the same diameter.

PLAIN DOWELS:

Plain dowels across contraction joints shall be smooth bars uniformly coated with a film of oil before concrete placement. Viscosity of the oil shall have a SAE rating of not less than 250.

ACCESSORIES:

Bar supports, spacers, and other accessories are not shown on the design drawings. The recommendations of the ACI Detailing Manual-1988, or other approved supporting systems may be used.

DRAWING REFERENCES:

Numerals in parentheses ( ) following notes and section letters or numbers indicate the number of the drawing upon which the section or detail is shown; for example (524) denotes Drawing No. 557-D-524.

CODE AND DETAILING REFERENCES:

ACI Building Code Requirements for Structural Concrete (ACI 318-95).
ACI Detailing Manual – 1994.

NOTES TO DESIGNERS AND DETAILERS:

Splice lengths shown in the tables on this drawing are for Class B tension lap splices in accordance with ACI 318-95. Assumed conditions for these tables in addition to the requirements shown on this drawing are uncoated reinforcement, normal weight concrete, and the transverse reinforcement index (K_{tr}) equal to zero. Splices or development lengths other than those shown in the tables must be detailed on the reinforcement design drawings.

Some factors which require additional consideration are: Beams or columns with ties, lightweight aggregate concrete, epoxy-coated reinforcement, excess reinforcement, bars in compression, bundled bars, and seismic considerations.

1/ Unless otherwise shown on the reinforcement design drawings or this drawing, follow the recommendations established by the ACI Detailing manual – 1994.

SPLICES:

The minimum length of lap for splicing parallel bars shall be as given in the applicable table.
Staggered splices shall be separated to give 12 inches clear between ends of adjacent splices.
Bars spliced by noncontact lap splices shall not be spaced transversely farther apart than one-fifth the required lap splice length, nor 6" on centers.
When reinforcing bars of different size are to be spliced, the length of lap shall be governed by the smaller diameter bar.
Splices are to be made so that the required clear distances to face of concrete will be maintained.

f'c = 3000 psi TABLE 3 – 60 fy = 60,000 psi

BAR SIZE NO.	MINIMUM ℄ to ℄ BAR SPACING (INCHES)	LENGTH OF LAPPED SPLICE (INCHES)		DEVELOPMENT LENGTH l_d (INCHES)	
		TOP BARS *	OTHER BARS	TOP BARS *	OTHER BARS
3	3	17	16	13	12
4	3	23	18	18	14
5	4	28	22	22	17
6	5	34	26	26	20
7	6	49	38	38	29
8	6	56	43	43	33
9	7	63	49	49	38
10	8	71	55	55	42
11	9	79	61	61	47
9	6	63 **	49 **	49	38
10	6	75 **	58 **	58	45
11	6	93 **	71 **	71	55

f'c = 4000 psi TABLE 4 – 60 fy = 60,000 psi

BAR SIZE NO.	MINIMUM ℄ to ℄ BAR SPACING (INCHES)	LENGTH OF LAPPED SPLICE (INCHES)		DEVELOPMENT LENGTH l_d (INCHES)	
		TOP BARS *	OTHER BARS	TOP BARS *	OTHER BARS
3	3	16	16	12	12
4	3	20	16	15	12
5	4	25	19	19	15
6	5	29	23	23	18
7	6	43	33	33	25
8	6	49	37	37	29
9	7	55	42	42	33
10	8	62	47	47	37
11	9	68	53	53	41
9	6	55 **	42 **	42	33
10	6	65 **	50 **	50	39
11	6	80 **	62 **	62	48

* Top bars are all horizontal bars so placed that more than 12 inches of fresh concrete is cast below the development length or splice.
** Splices must be staggered.

6-1-97 D- G.P.G.	CONVERTED TO AUTOCAD DRAWING. REVISED TO CONFORM TO ACI 318-95. OTHER MINOR REVISIONS.
2-29-92 D- ROA	TOP BAR DEFINITION AND MINOR PUNCTUATION REVISION IN PLACING NOTE.
12-7-90 D- J.D.S.	REDRAWN TO NEW DRAFTING STANDARDS. REVISED CONCRETE COVER, NOTES TO DESIGNERS, TABLES, REINFORCEMENT AROUND OPENINGS, AND OTHER MINOR REVISIONS. REVISED TO CONFORM TO ACI 318-89.
9-27-84 D- NFP DG	REVISED PIN DIAMETER TABLE, REFERENCED THE ACI DETAILING MANUAL 1980. ADDED NOTES UNDER PLACING AND STANDARD HOOKS.
12-8-76 D- WRW	MINOR REVISIONS.

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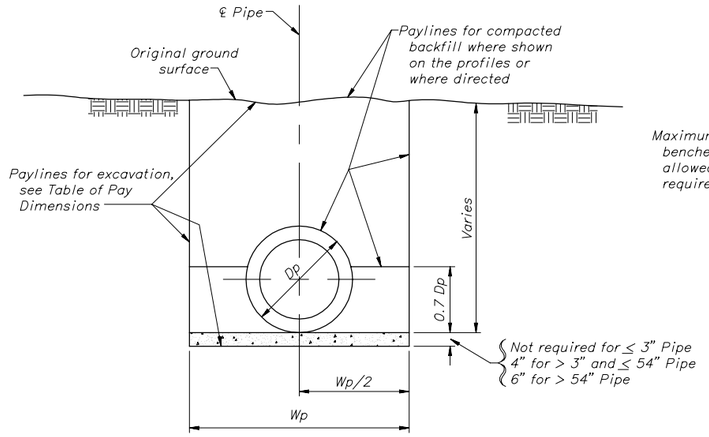
STANDARD DESIGNS

GENERAL NOTES AND MINIMUM REQUIREMENTS FOR DETAILING REINFORCEMENT

DESIGNED M.F.WARD J.G.STARBUCK CHECKED GAYLE A.ERICKSON
DRAWN M.CAMPBELL TECH. APPROVAL H.G.ARTHUR
ACTING DIRECTOR, DESIGN AND CONSTRUCTION

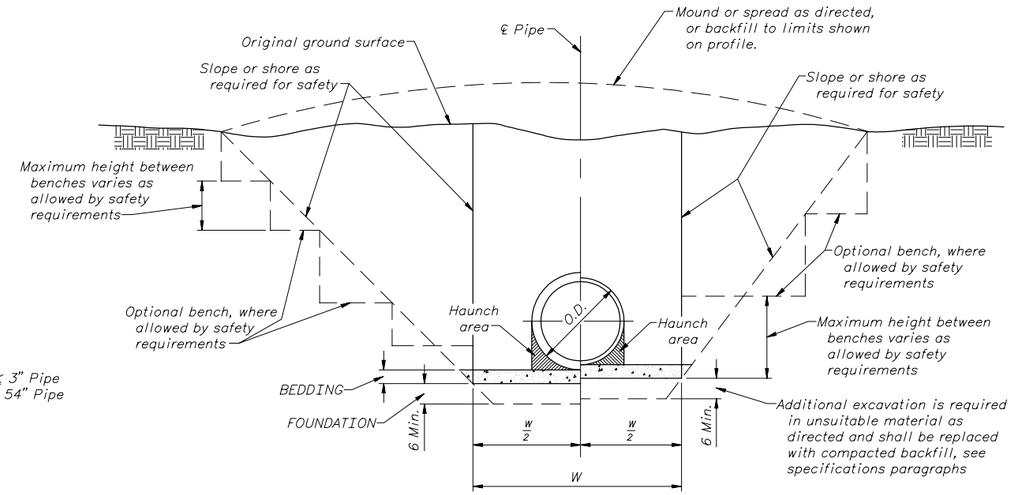
CADD SYSTEM AutoCAD Rel. 15.06	CADD FILENAME 40-D-6263.DWG	DATE AND TIME PLOTTED APRIL 3, 2003 13:49
DENVER, COLORADO	JULY 12, 1972	40-D-6263



TRENCH FOR PAYLINES ONLY ALL TYPES OF PIPE

TABLE OF PAY DIMENSIONS

Pipe I.D. (Inches)	Dp (Inches)	Wp (Feet)
6 and less	I.D. + 2	2.0
Over 6 thru 18	I.D. + 4	$\frac{1}{12}$ (I.D. +24)
Over 18 thru 24	I.D. + 4	$\frac{1}{12}$ (I.D. +40)
Over 24	1.167 I.D.	$\frac{1}{12}$ (1.167 I.D. + 36)



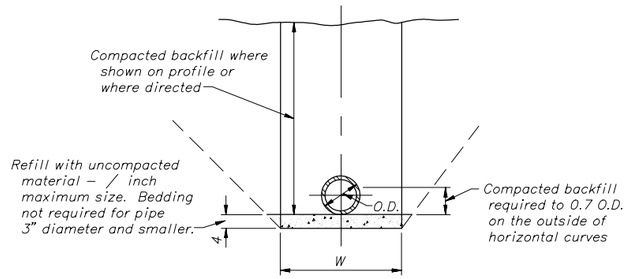
HALF SECTION RIGID PIPE

HALF SECTION FLEXIBLE PIPE

TYPICAL TRENCH DETAILS

MINIMUM INSTALLATION WIDTH

PIPE I.D. (INCHES)	W (FEET)
6 and less	2.0
Over 6 thru 18	$\frac{1}{12}$ (O.D. + 20)
Over 18	$\frac{1}{12}$ (O.D. + 36)



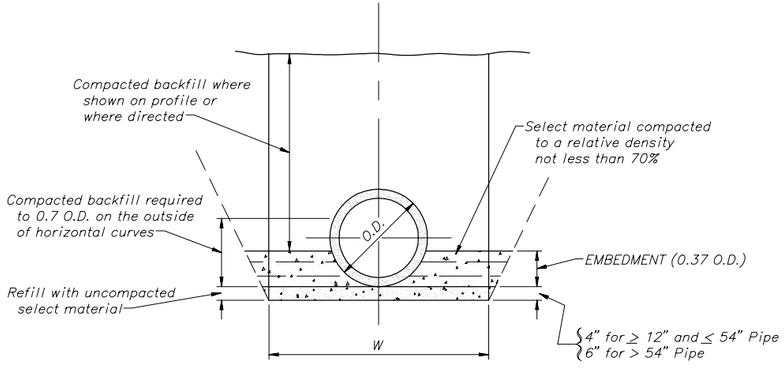
PIPE 10 INCH DIAMETER AND SMALLER

PVC
STEEL
DUCTILE IRON

GRADUATION LIMITS FOR SELECT MATERIAL

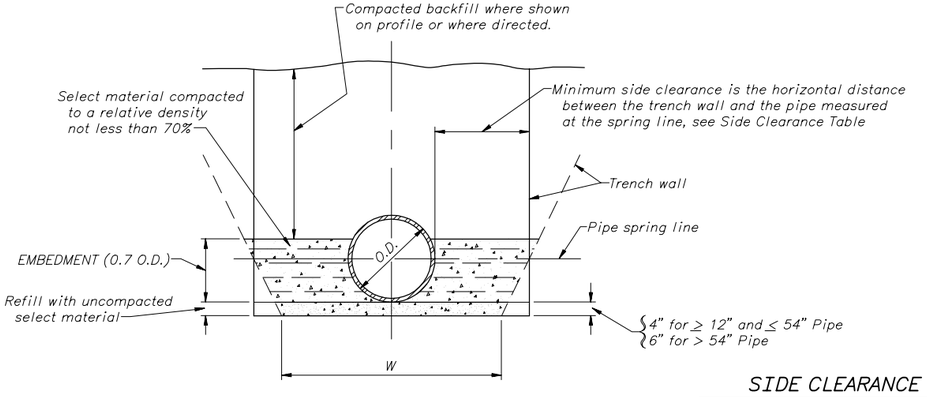
SIZE *	PERCENT BY WEIGHT
Passing No. 200 sieve	5 or less
Passing No. 50 sieve	25 or less

* Maximum size shall not exceed $\frac{3}{4}$ inch.



RIGID PIPE

DUCTILE IRON _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 12" – 20"
REINFORCED CONCRETE _ _ _ _ _ _ _ _ _ _ _ _ 12" AND LARGER
REINFORCED CONCRETE CYLINDER _ _ _ _ _ 48" AND LARGER



FLEXIBLE PIPE

PVC _ 12" – 36"
PRETENSIONED CONCRETE CYLINDER _ _ _ _ 12" – 66"
STEEL _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 12" AND LARGER
FIBERGLASS _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 12" AND LARGER
DUCTILE IRON _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 24" AND LARGER

SIDE CLEARANCE TABLE

TRENCH TYPE	MINIMUM SIDE CLEARANCE (INCHES)
1	10 INCHES FOR 12" THRU 18" I.D. 18 INCHES FOR OVER 18" I.D.
2	ONE O.D.
3	TWO O.D.

For location of Trench Types, see Specifications.

NOTES

Dp and Wp are used for calculating pay quantities for all pipe and trench types. Calculations are based on vertical walls.
Paylines for backfill will be the paylines for excavation, except the volume of the pipe, based on the diameter Dp will be deducted, and except where the depth of backfill is limited as shown on profiles.
W is minimum width of excavation in feet at bottom of bedding. The minimum side clearance for flexible pipe may require a wider trench bottom than dimension W.
Pipe diameters shown are the nominal inside diameter (I.D.) of the pipe in inches unless otherwise indicated.
O.D. is outside diameter in inches of the pipe actually installed.
Where pipe slope exceeds 0.3, see specifications paragraphs for backfill in pipe trenches.
Sloping, shoring, and benching shall be in accordance with Reclamation Construction Safety Standards.
Other installation methods with comparable pipe designs may be submitted for approval.

11/27/91 D- LAK	REMOVED NOTES ABOUT EQUAL LIFTS "RIGID PIPE" AND "FLEXIBLE PIPE".
10/17/91 D- LAK	REDRAWN WITH MINOR REVISIONS.

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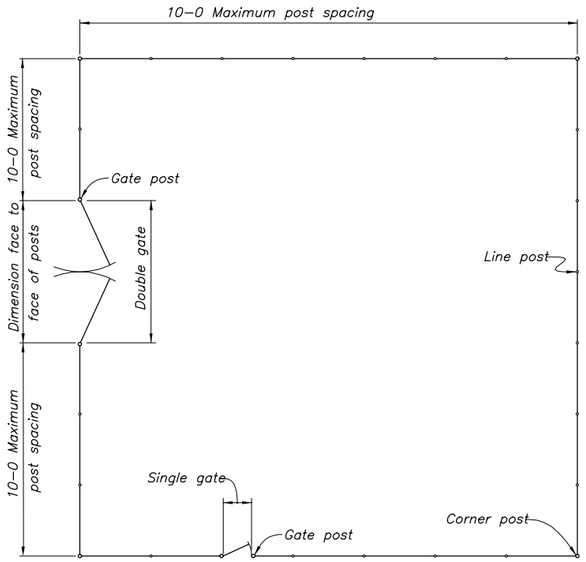
STANDARD DESIGNS

PRESSURE PIPE TRENCH INSTALLATION

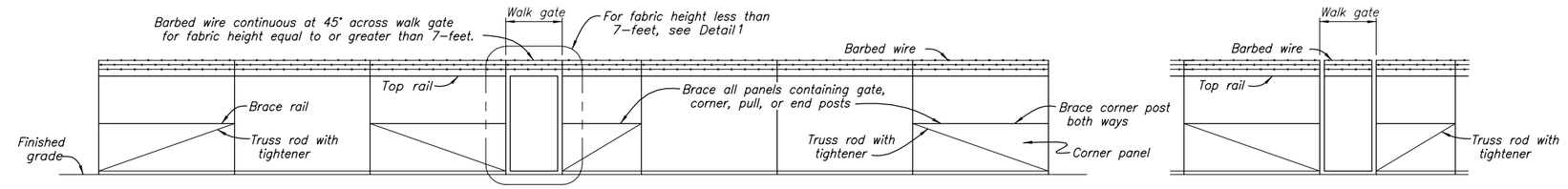
SELECT MATERIAL

DESIGNED Richard P. Fuerst TECHNICAL APPROVAL Leo A. Kinney, Jr.
DRAWN Bob Schully SUBMITTED Douglas H. Wegener
CHECKED Leo A. Kinney, Jr. APPROVED W. L. Long
CHIEF, WATER CONVEYANCE BRANCH

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AutoCAD Rel. 15.0	40-D-6551.DWG	JULY 20, 2000 08:03
DENVER, COLORADO	APRIL 1, 1991	40-D-6551

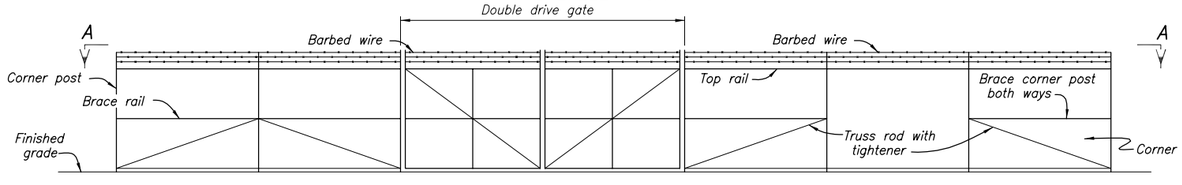


TYPICAL FENCING PLAN

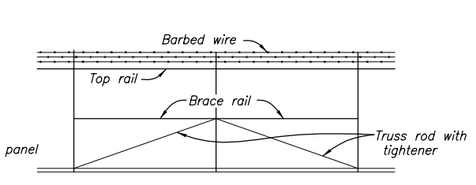


TYPICAL ELEVATION

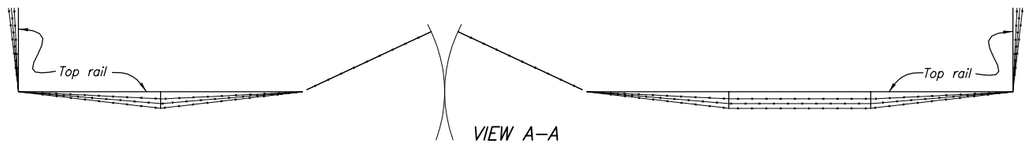
DETAIL 1



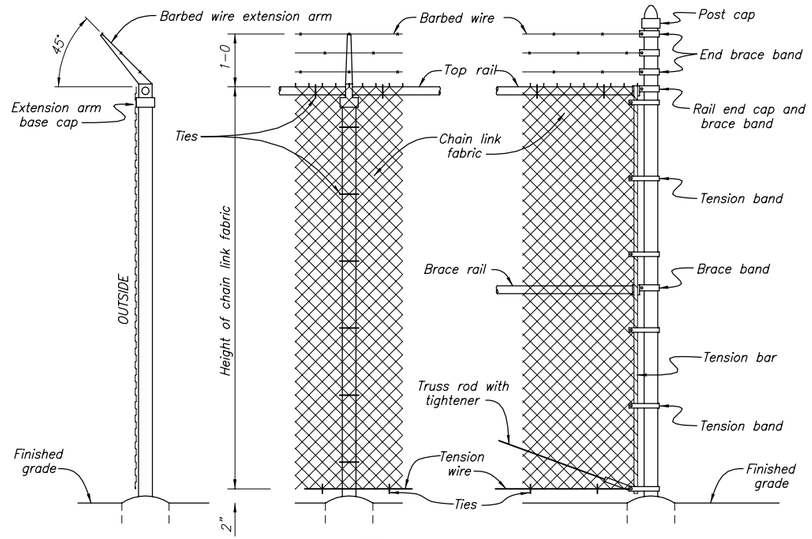
TYPICAL ELEVATION



PULL POST

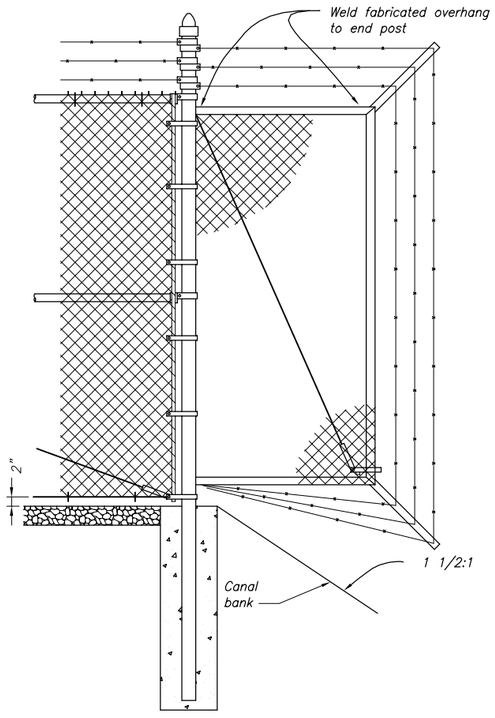


VIEW A–A

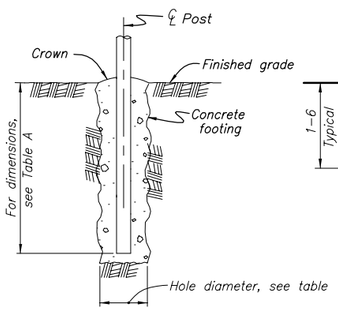


LINE POST

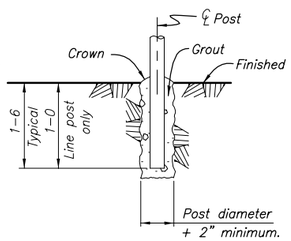
END POST, CORNER POST, OR GATE POST



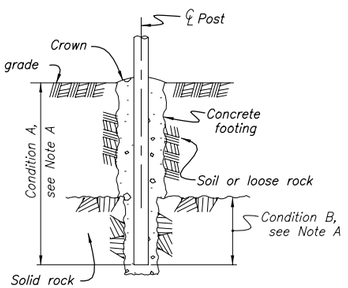
FENCE OVERHANG DETAIL



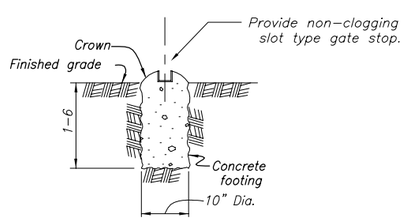
SOIL OR LOOSE ROCK



SOLID ROCK



POST FOOTING IN SOLID ROCK WITH OVERBURDEN OF SOIL OR LOOSE ROCK



GATE STOP FOOTING

TABLE A

POST FOOTING SIZES IN SOIL OR LOOSE ROCK

POST	FABRIC HEIGHT	HOLE DIAMETER AT TOP	HOLE DEPTH	POST EMBEDMENT
Line	3 ft. to 4 ft.	6 inches	24 inches	21 inches
Line	5 ft.	8 inches	30 inches	27 inches
Line	6 ft. to 12 ft.	9 inches	38 inches	36 inches
Terminal	3 ft. to 5 ft.	10 inches	32 inches	30 inches
Terminal	6 ft. to 12 ft.	12 inches	38 inches	36 inches

Note A: Satisfy Condition A or Condition B.
Condition A: Depth required for footing in soil or loose rock.
Condition B: Depth required for embedment in rock.

NOTES

All fencing materials and accessories shall be in accordance with the specifications and the Chain Link Fencing Manufacturers Institute (CLFMI) standards.
All post and frame dimensions shall be in accordance with Table 4 (CLFMI). Concrete footing dimensions shall be in accordance with Table A above.
See site plans for fence layout and swing of gate.
Install pull posts at a maximum interval of 500 feet and at changes in horizontal or vertical alignment.
Weld all joints between tubular gate frame members and frame overhangs or use heavy fittings to provide rigid and watertight connections.
Provide latches, stops and keepers for all gates as specified.
End posts, corner posts, pull posts, and gate posts are designed as terminal posts.
Brace rails are not required for fabric less than 6 feet high.
For typical grounding details, see 40–D–4334, 40–D–4335 and 40–D–6376.

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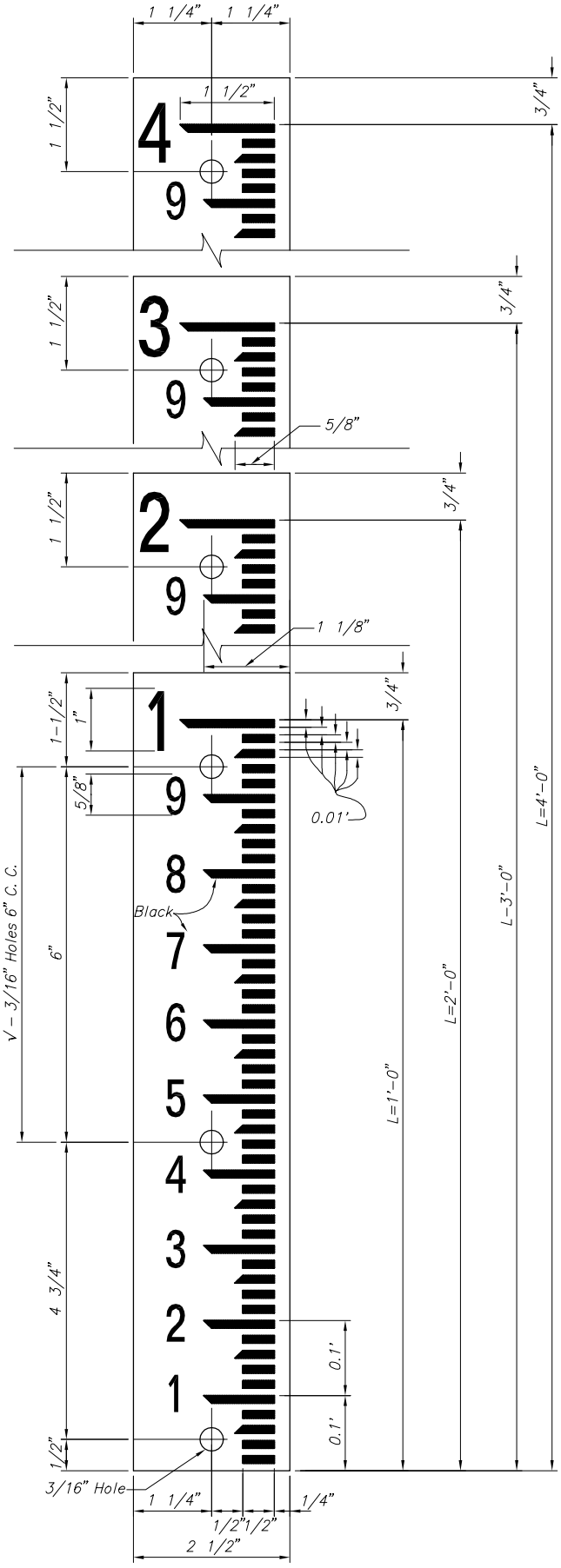
STANDARD DRAWINGS

CHAIN LINK FENCING DETAILS

DESIGNED CLFMI STANDARD
DRAWN Charles H. Ferguson
CHECKED Douglas K. Vice
TECHNICAL APPROVAL
APPROVED
PROJECT CONSTRUCTION ENGINEER

Cadd System: AutoCAD Release 13	Filename: YAK255.DWG	Date and Time Plotted: April 17, 1997
YAKIMA, WASHINGTON CADD	FEBRUARY 1997	1022–155–255



NOTES:

Gages to be of No. 18 gage (U.S. standard) mild steel plate and to be covered with porcelain enamel with a minimum thickness of 12 mils on numeral side and 3 mils on the reverse side and on edges where plate has been cut, punched or drilled.

All cutting, drilling and punching of the plates shall be completed before the porcelain enamel is applied.

The face of the gage shall be white and all numerals and graduations shall be black.

Graduations shall be sharp and accurate to the dimensions shown.

The length "L" shall be as given in the schedule. In case a greater length than 4'-0" is required the details shall be similar to details shown for shorter lengths.

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STANDARD DESIGNS

ENAMELED WEIR GAGES

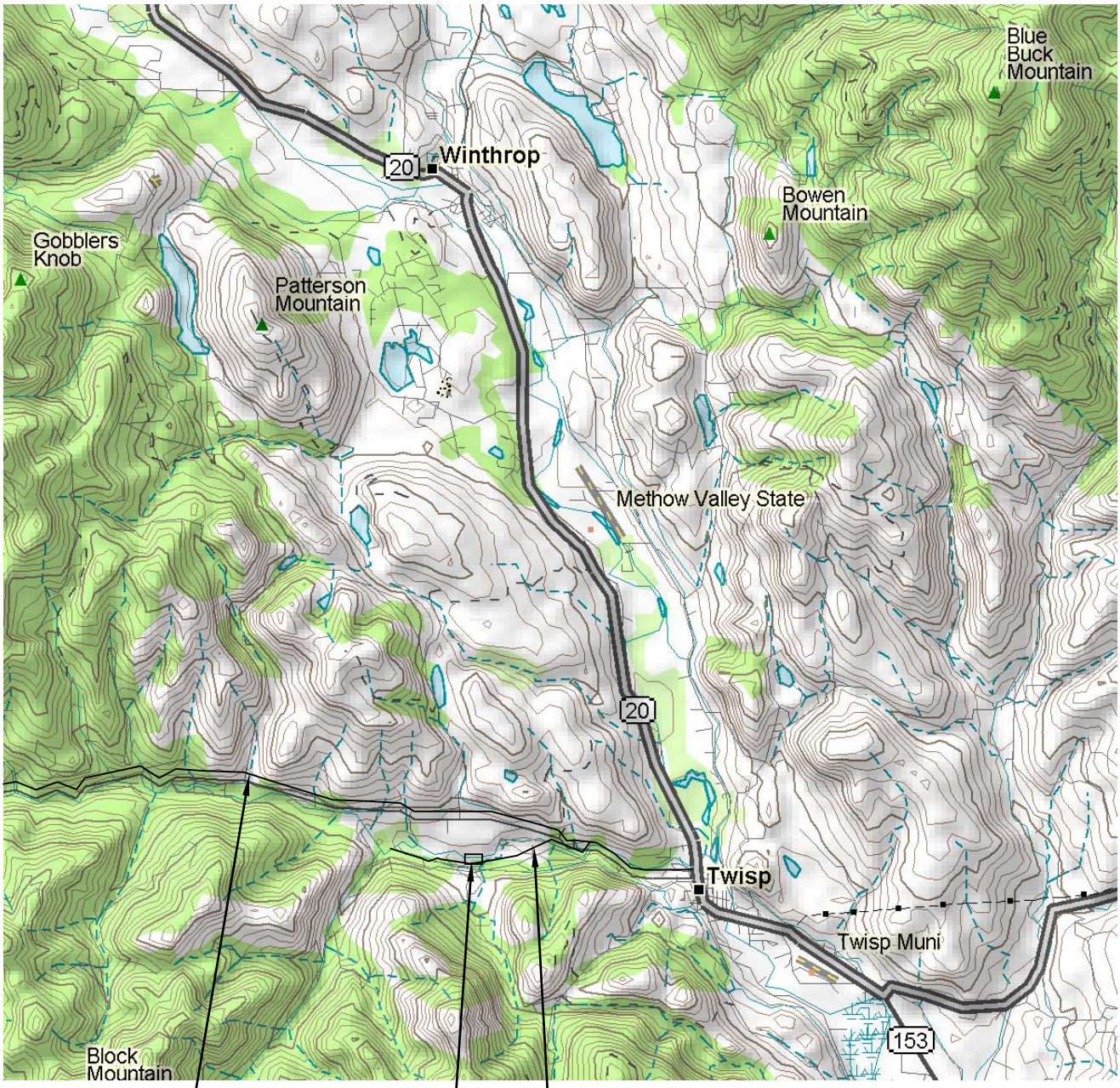
DESIGNED _____ TECH. APPROVAL _____

DRAWN I. Lawyer _____

CHECKED _____ APPROVED _____

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AutoCAD Rel.12	9003-100-217.DWG	JULY 15, 1996 09:56
BOISE, IDAHO	FEBRUARY 1995	9003-100-217

APPENDIX B
MVID West Fish Screen Structure



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FISH PASSAGE AND PROTECTION FACILITIES

METHOW VALLEY IRRIGATION DISTRICT

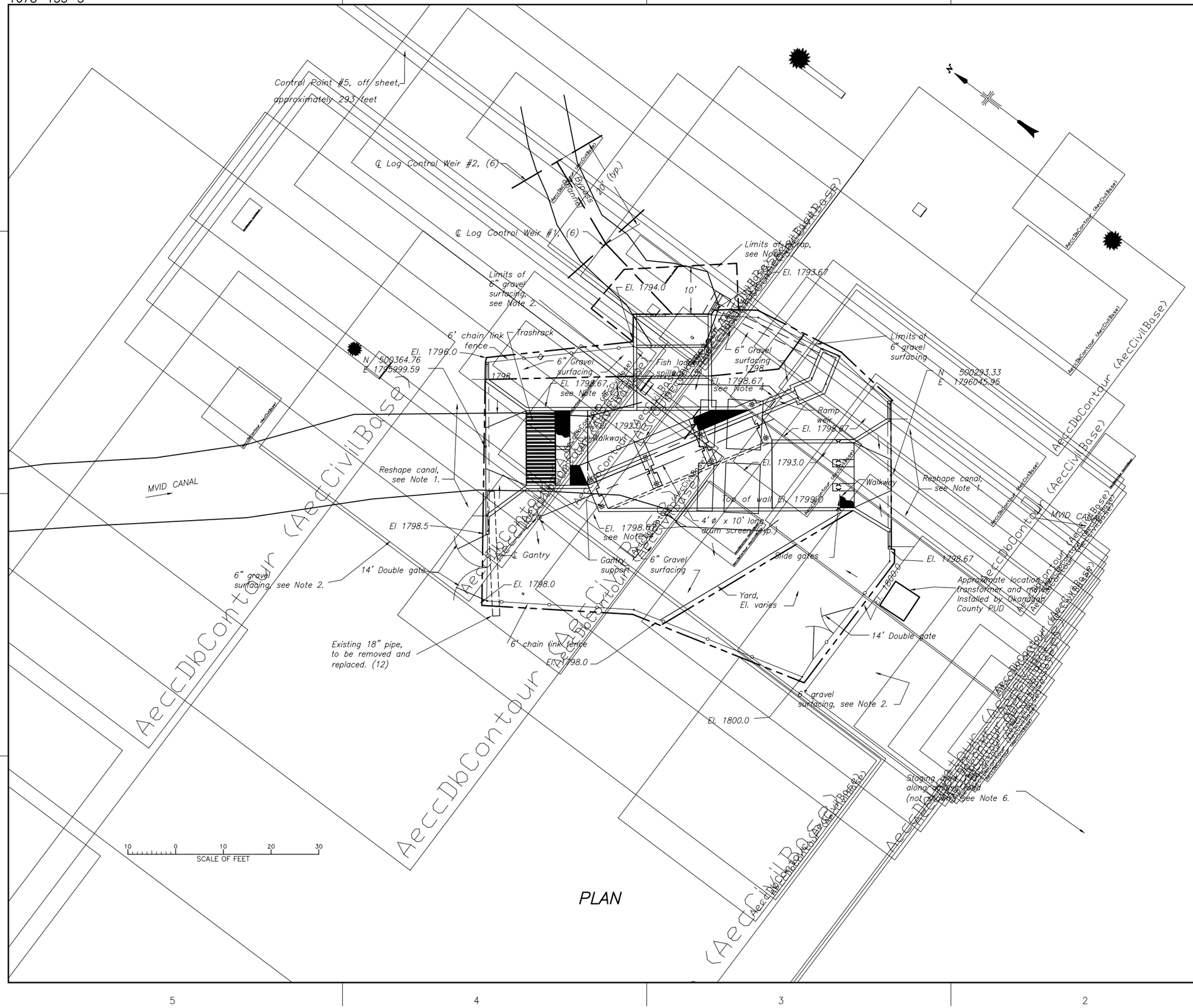
WEST FISH SCREEN STRUCTURE

LOCATION MAP

DESIGNED Gwendolyn Christensen CHECKED Todd Hill

DRAWN Gwendolyn Christensen TECH. APPROVAL John Manfredi
PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AUTOCAD2000	16781552.DWG	07/24/03
YAKIMA, WASHINGTON	JULY 24, 2003	1678-155-2



PLAN

NOTES:

1. Reshape canal as directed 20' upstream and downstream from concrete transitions.
2. Gravel surface within fenceline and 20 ft. outside fence at gate openings.
3. Existing ground contours shown outside of structures and fence limits. Slope finish grade from 1' outside fenceline on 1.5:1 to meet existing ground, except 10:1 outside gates.
4. Finished grade around concrete structure walls El. 1798.67, unless otherwise shown. Slope finish grade uniformly from structure to breaklines and point elevations shown 1' outside fenceline.
5. Riprap bypass channel, invert, and finish channel slopes to elevation 1794.0.
6. Staging area is located along access road approximately 150 ft. south of screen site and is 100 by 95.
7. Survey information: Site was surveyed October 2002. Basis of Bearing – Washington State Plane North Zone Coordiante System NAD 83. Horizontal Control – Washington State Plane North Zone Coordiante System North Zone NAD 83. Based on GPS Observation from DOT BC F378. Vertical Control – North American Vertical Datim of 1988 Based on GPS Observation from DOT BC F378.
8. Referece drawing 1678-155-12 for existing screen and spillway demolition.
9. Numbers in parentheses are drawing numbers.

SURVEY CONTROL:

CONTROL POINT	Northing	Easting	Elevation
5	500432.38	1796105.71	1791.86
1707	500205.81	1796091.22	1797.46

LEGEND:

1798	Finished grade breakline, elevation, see Note 4.
El. 1796.0	Finished grade point elevation, see Note 4.
⚠	Survey control points, see Note 7.

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METHOW VALLEY IRRIGATION DISTRICT

WEST FISH SCREEN STRUCTURE

SITE PLAN

DESIGNED	Gwendolyn Christensen	CHECKED	Todd Hill
DRAWN	Gwendolyn Christensen	TECH. APPROVAL	John Manfredi, PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
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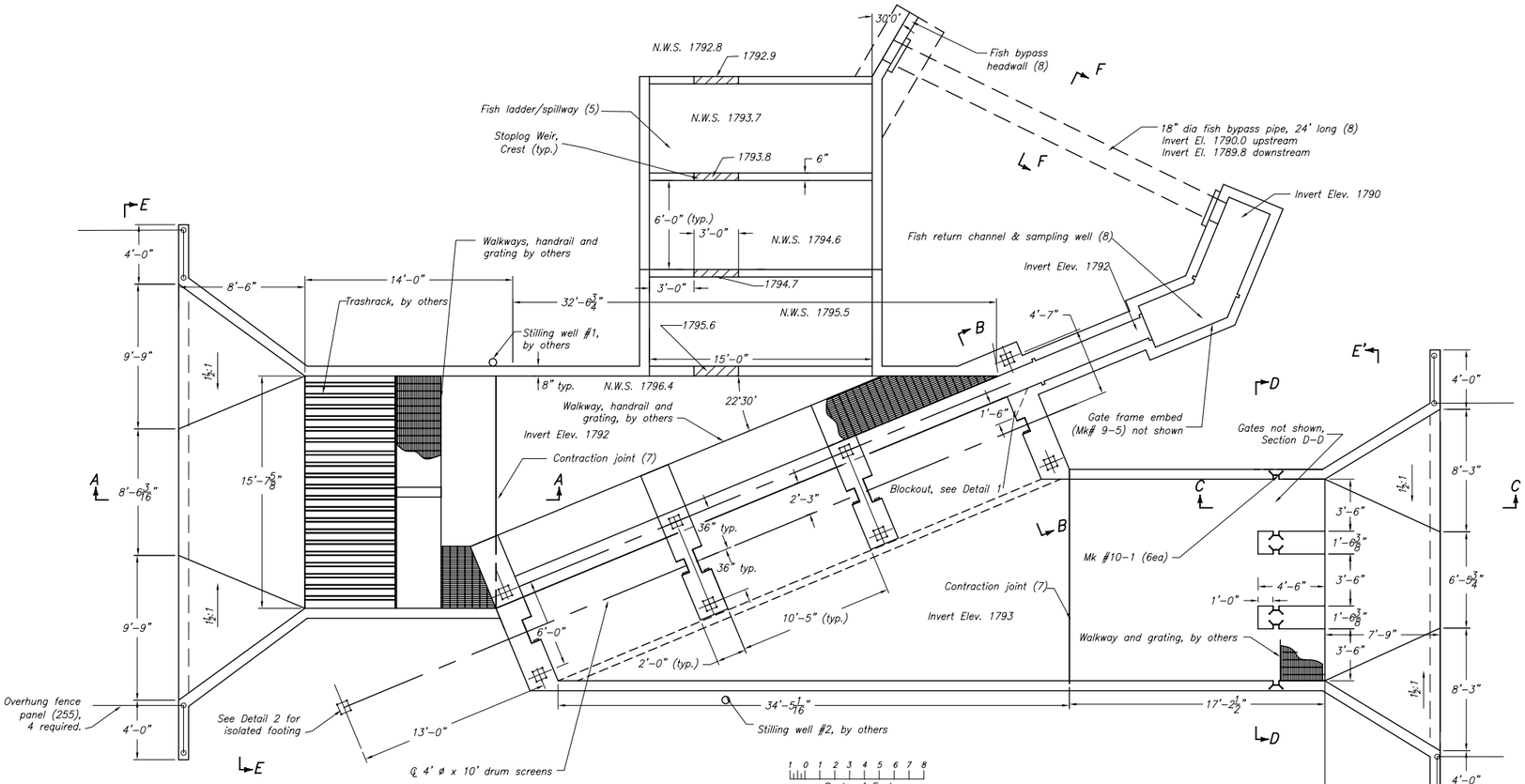
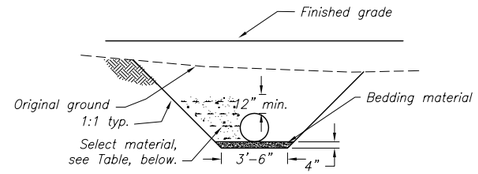
YAKIMA, WASHINGTON	AUGUST 28, 2003	1678-155-3



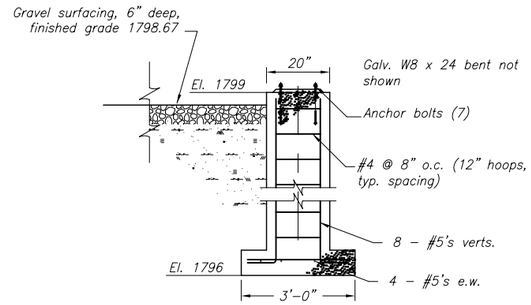


SECTION F-F

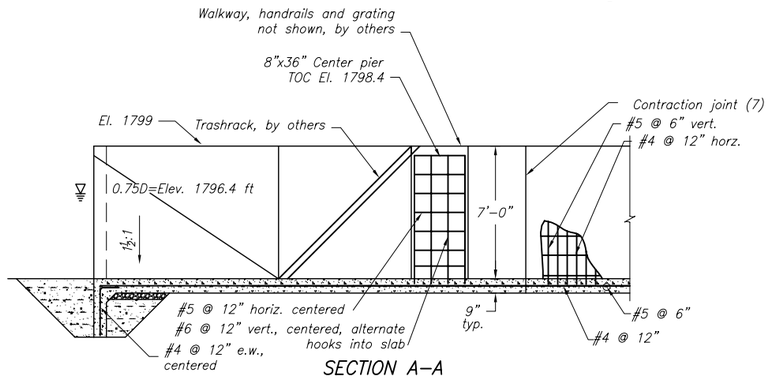
GRADATION LIMITS FOR SELECT MATERIAL

SIZE*	PERCENT WEIGHT BY PASSING
Passing No. 4 seive	50-75
Passing No. 50 seive	10-25
Passing No. 200 sieve	12 or less

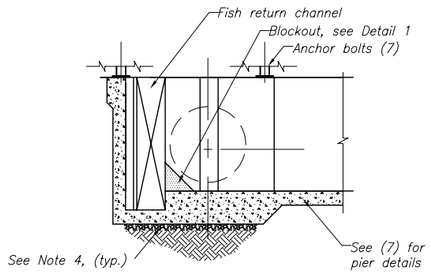
* Maximum particle size shall not exceed ¾ inch.



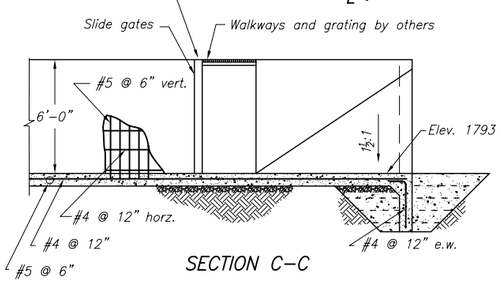
DETAIL 2
ISOLATED FOOTING



SECTION A-A



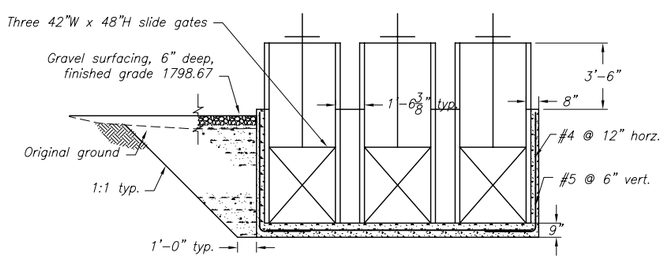
SECTION B-B



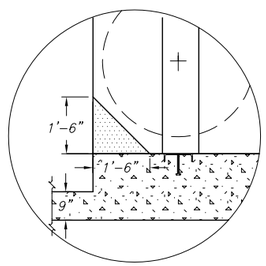
SECTION C-C

NOTES:

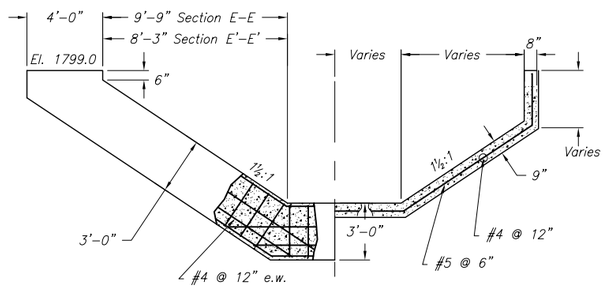
1. Number in parentheses are drawing numbers.
2. Structural design is based on concrete with a minimum compressive strength of 4000 psi at 28 days, and a minimum reinforcement steel yield strength of 60000 psi. See 40-D-6263 for minimum requirements for detailing reinforcement.
3. Fabrication and installation of the rotary drum screens, walkway grating and framing, handrails, trashrack, ramp flume and lift, and gantry frame metalwork items to be performed by others.
4. All buried and embedded electrical conduits to be installed by contractor.
5. 4" of ⅜" minus crushed gravel bedding required below all concrete slabs.



SECTION D-D



DETAIL 1
BLOCKOUT



SECTION E-E
SECTION E'-E' similar

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METHOW VALLEY IRRIGATION DISTRICT

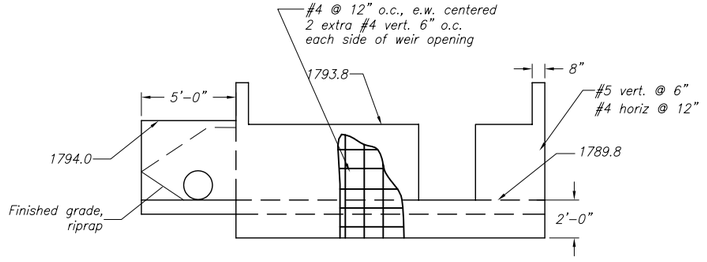
WEST FISH SCREEN STRUCTURE

PLAN, SECTIONS & DETAILS

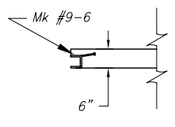
DESIGNED_ Gwendolyn Christensen _ _ _ CHECKED _ Todd Hill _ _ _ _ _ _ _

DRAWN _Gwendolyn Christensen_ _ _ _ _ TECH. APPROVAL _John Manfredi_ _ _
PROGRAM MANAGER

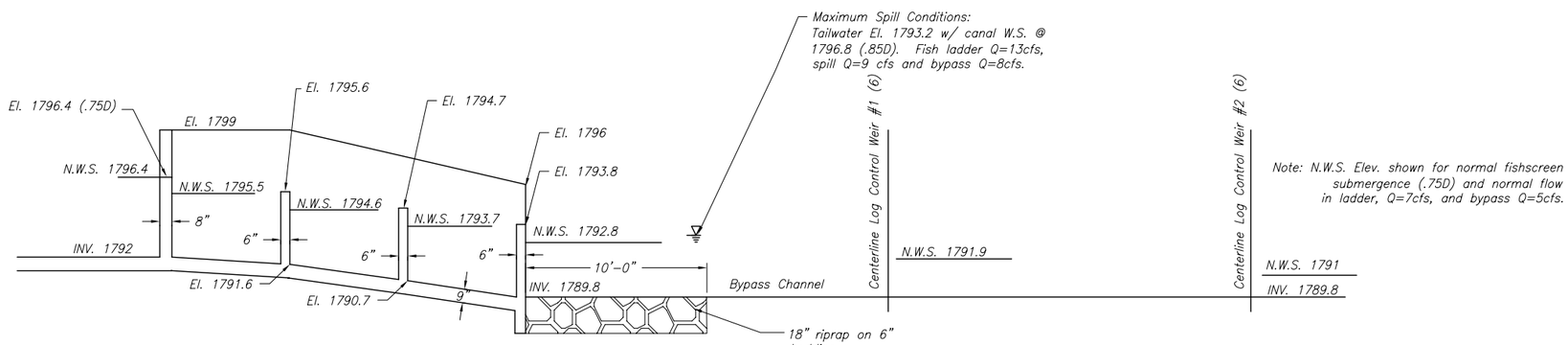
CADD SYSTEM AUTOCAD2000	CADD FILENAME 16781554.DWG	DATE AND TIME PLOTTED
YAKIMA, WASHINGTON	AUGUST 28, 2003	1678-155-4



SECTION H-H



DETAIL 3
FISH LADDER WALL GUIDE
(4 as shown, 4 opposite side)



SECTION G-G
PROFILE

Note: N.W.S. Elev. shown for normal fishscreen submergence (.75D) and normal flow in ladder, Q=7cfs, and bypass Q=5cfs.

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METHOW VALLEY IRRIGATION DISTRICT

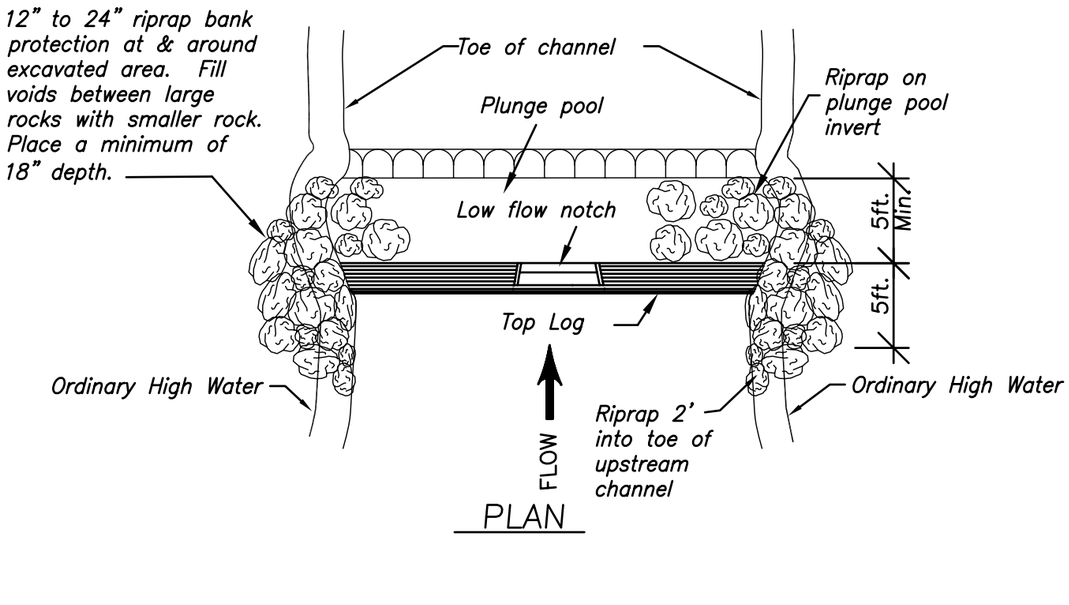
FISH LADDER AND SPILLWAY

PLAN AND SECTIONS

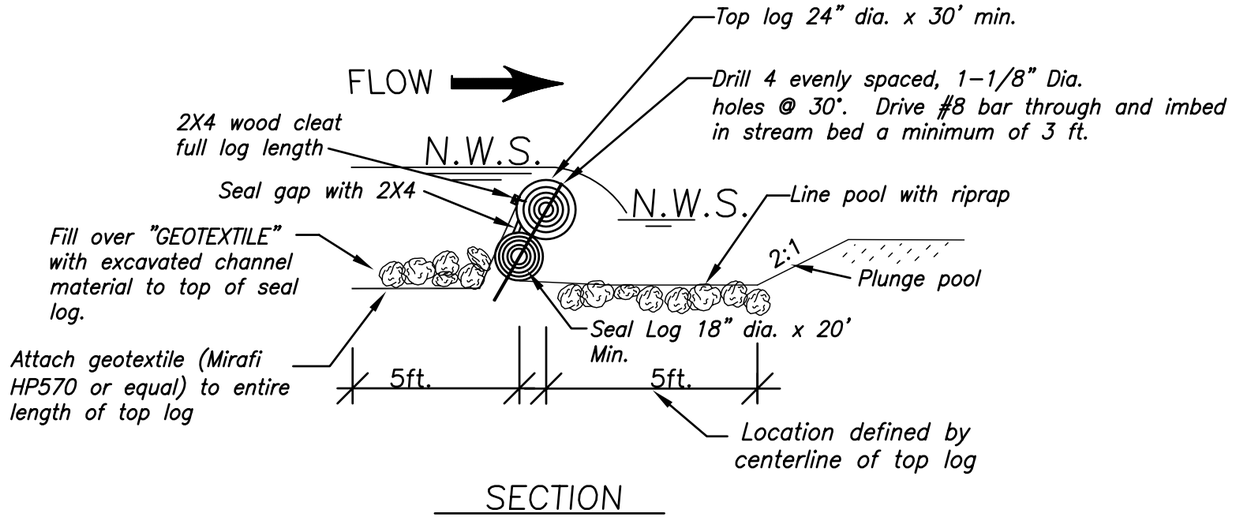
DESIGNED_ Gwendolyn Christensen _ _ _ CHECKED _ Todd Hill _ _ _ _ _ _ _ _

DRAWN _Gwendolyn Christensen_ _ _ _ _ TECH. APPROVAL _John Monfredi_ _ _
PROGRAM MANAGER

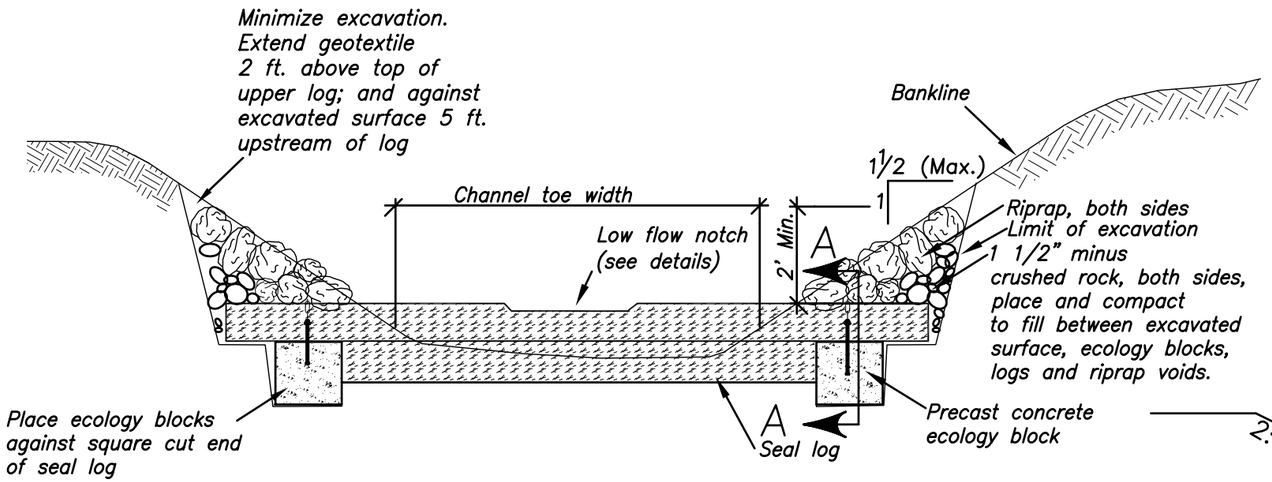
CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AUTOCAD2000	16781555.DWG	
YAKIMA, WASHINGTON	AUGUST 28, 2003	1678-155-5



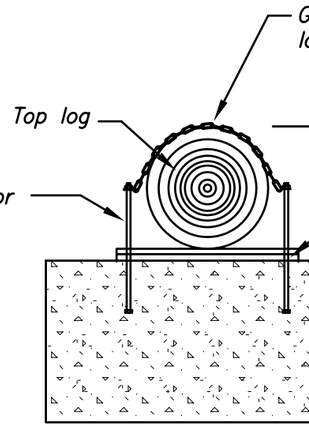
PLAN



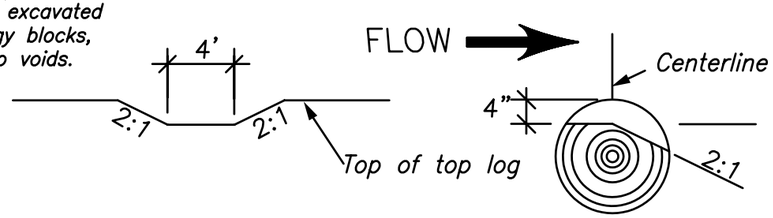
SECTION



ELEVATION



SECTION A-A
Seal log, not shown



ELEVATION SECTION
LOW FLOW NOTCH DETAILS

NOTES:

1. Not To Scale
2. See Drawings 1678-155-3 and 5 for Log Control Weir locations.
3. Drawing adapted from State of Washington Department of Fish and Wildlife Logcon.dwg

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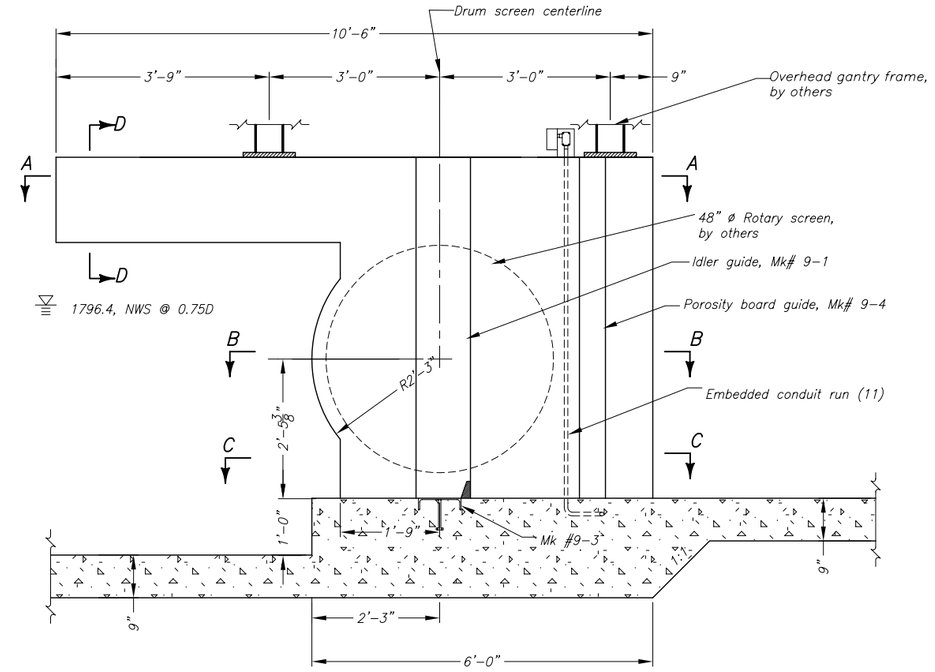
METHOW VALLEY IRRIGATION DISTRICT

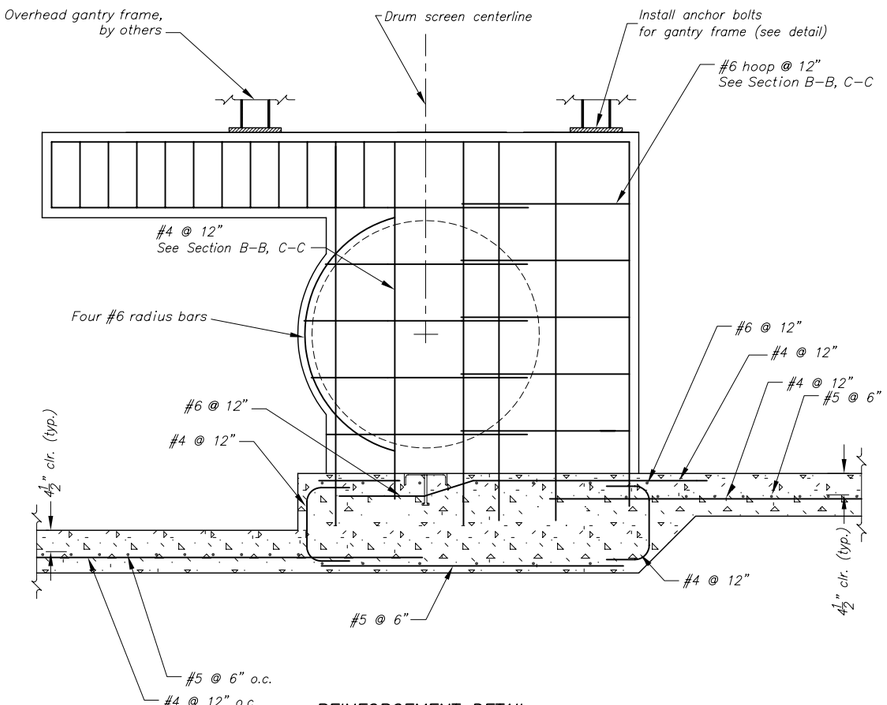
LOG CONTROL WEIRS #1 AND #2
PLAN, SECTIONS, DETAILS

DESIGNED_ Gwendolyn Christensen _ _ _ _ CHECKED _ _ Todd Hill _ _ _ _ _ _ _
DRAWN _ Gwendolyn Christensen _ _ _ _ _ TECH. APPROVAL _ John Manfredi _ _ _
PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AUTOCAD2000	16781556.DWG	
YAKIMA, WASHINGTON	AUGUST 28, 2003	1678-155-6

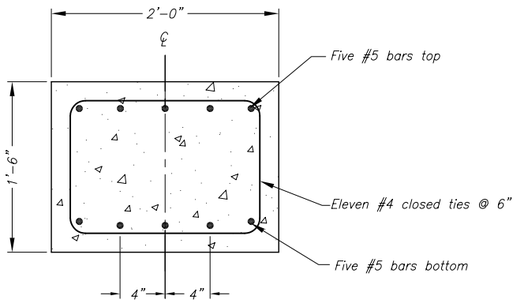


PIER ELEVATION

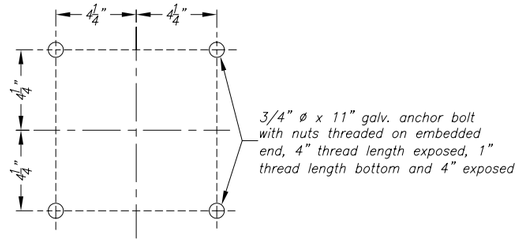


REINFORCEMENT DETAIL

Near face shown

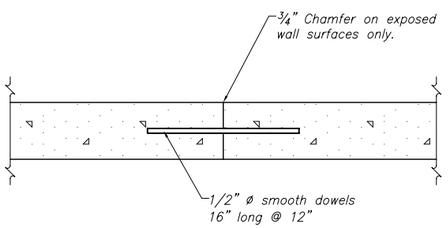


SECTION D-D



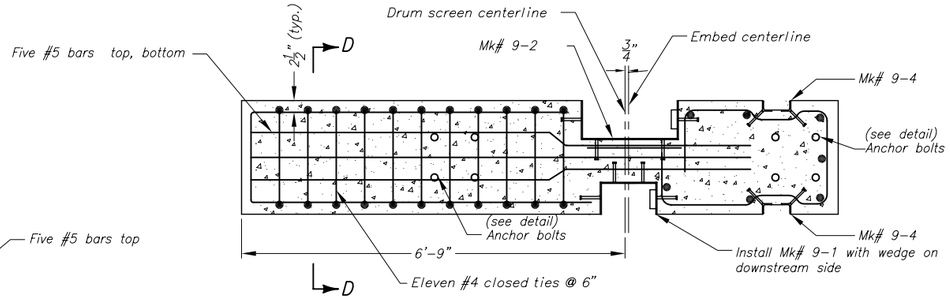
ANCHOR BOLT DETAIL

(9 locations)

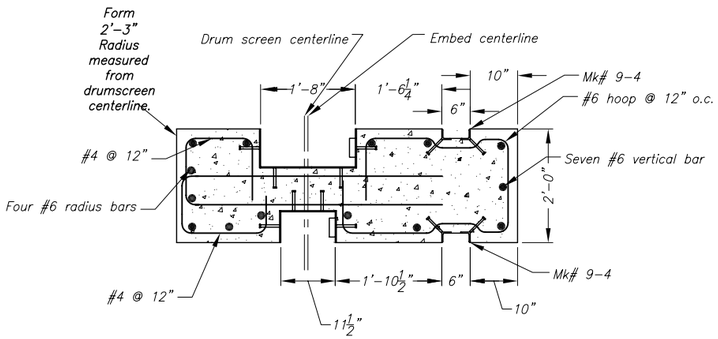


TYPICAL FLOOR AND WALL CONTRACTION JOINT

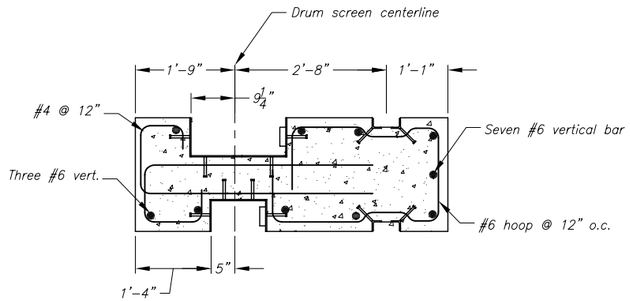
Reinforcement not shown



SECTION A-A



SECTION B-B



SECTION C-C

NOTES:

Driver and Idlers guide centerlines are offset ¾"downstream from screen centerline and overhead gantry frame.

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FISH PASSAGE AND PROTECTIVE FACILITIES

METHOW VALLEY IRRIGATION DISTRICT

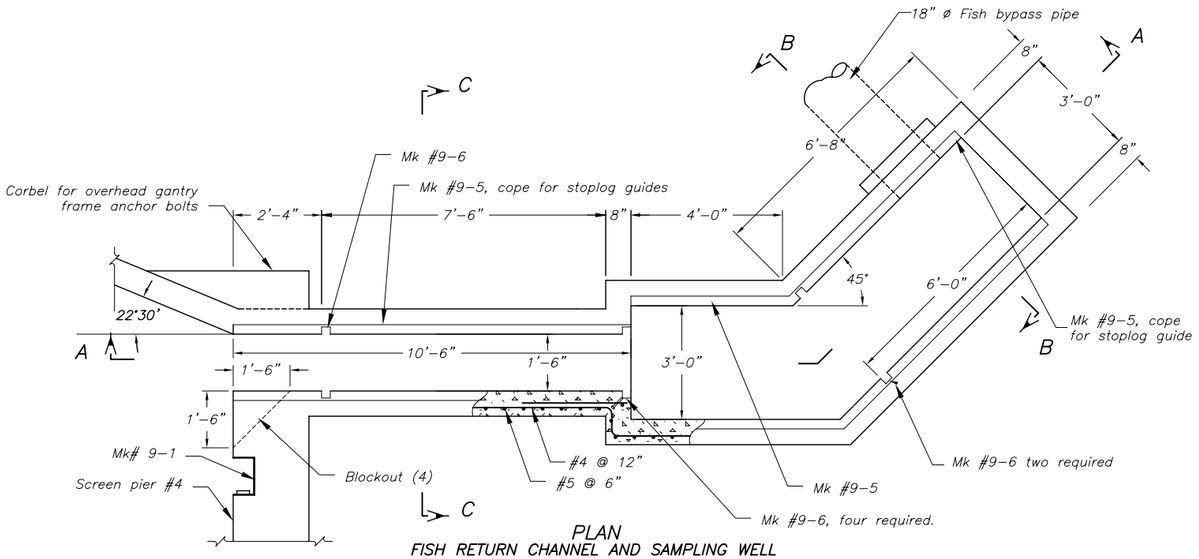
WEST CANAL FISHSCREEN STRUCTURE

STANDARD PIER FOR 48" ø ROTARY SCREEN

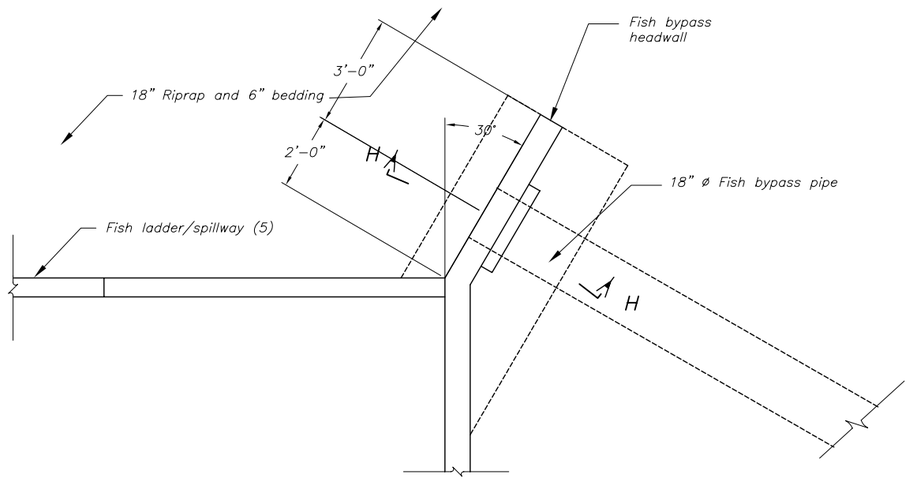
DESIGNED Gwendolyn Christensen CHECKED Todd Hill

DRAWN Gwendolyn Christensen TECH. APPROVAL John Manfredi PROGRAM MANAGER

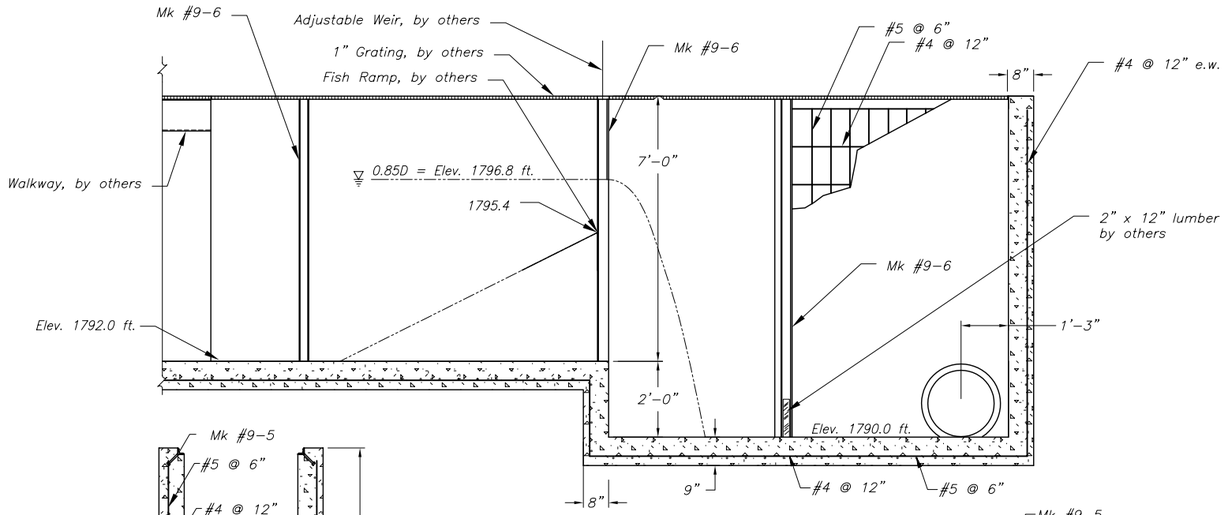
CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
ACAD2000	16781557.DWG	
YAKIMA, WASHINGTON	AUGUST 28, 2003	1678-155-7



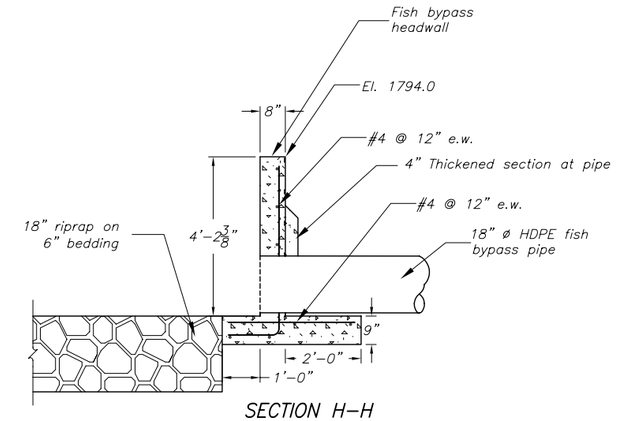
PLAN
FISH RETURN CHANNEL AND SAMPLING WELL



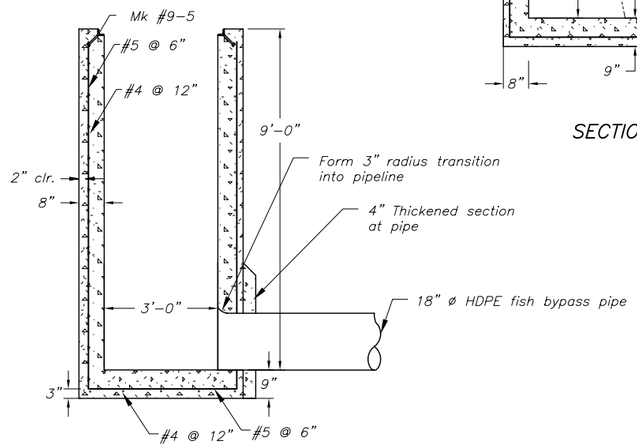
OUTLET STRUCTURE
PLAN



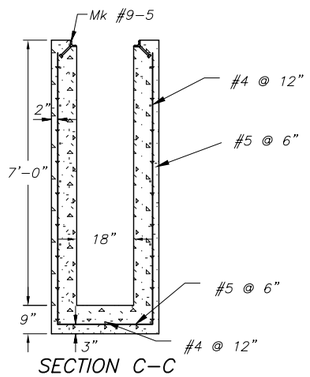
SECTION A-A



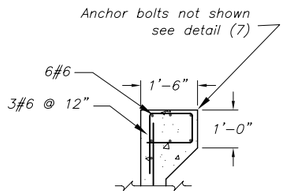
SECTION H-H



SECTION B-B



SECTION C-C



CORBEL

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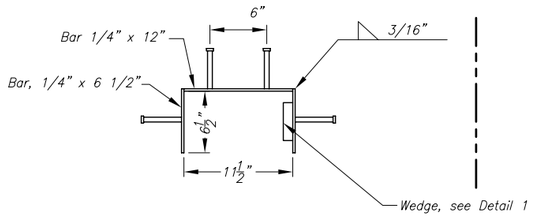
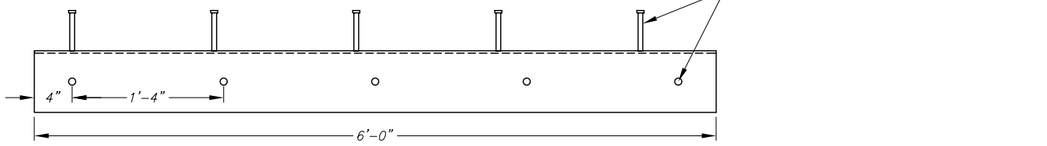
METHOW VALLEY IRRIGATION DISTRICT

FISH BYPASS CHANNEL, SAMPLING WELL
& OUTLET STRUCTURE

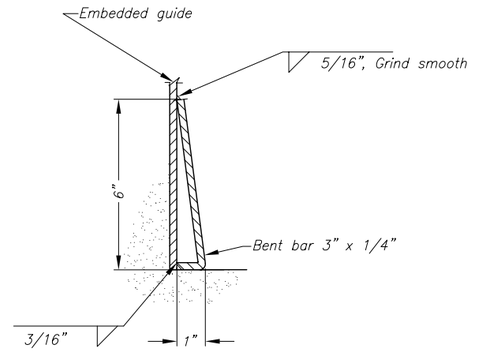
DESIGNED Gwendolyn Christensen CHECKED Todd Hill
DRAWN Gwendolyn Christensen TECH. APPROVAL John Manfredi
PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AutoCAD 2000 YAKIMA, WASHINGTON	16781558.dwg AUGUST 28, 2003	1678-155-8

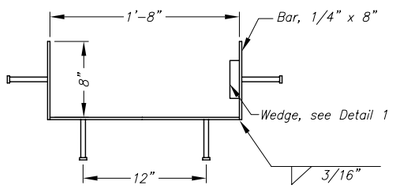


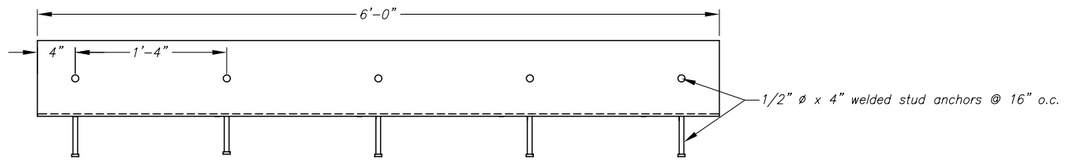


MK# 9-1, IDLER GUIDE, three required



Detail 1





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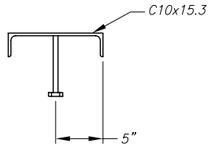
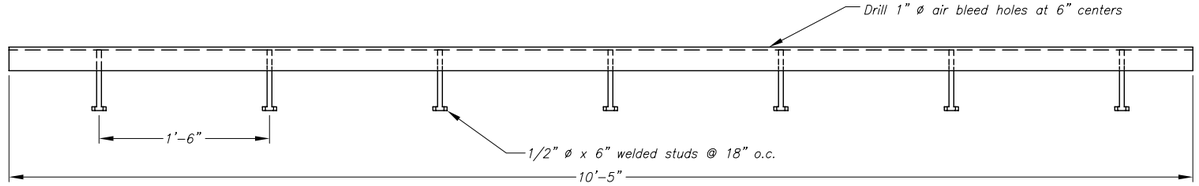
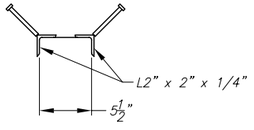
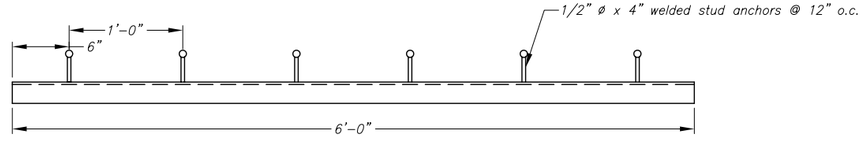


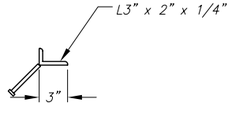


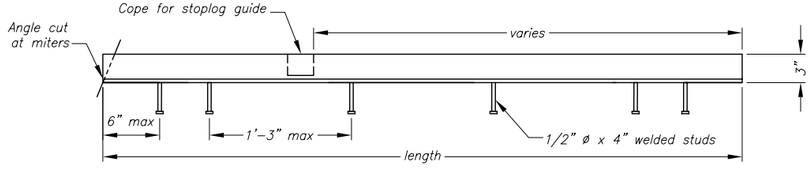
MK# 9-3, SILL PLATE, three required



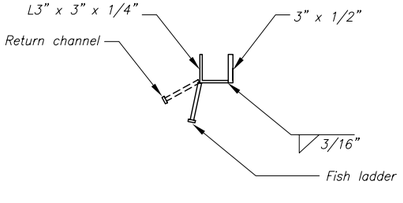


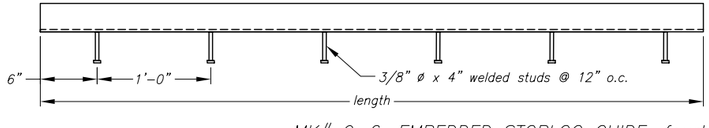
MK# 9-4, POROSITY BOARD GUIDES, six pairs required





PLAN VIEW, MK# 9-5, EMBEDDED GRATING FRAME, four required
two as shown, two opposite





MK# 9-6, EMBEDDED STOPLOG GUIDE, fourteen required
4 @ 7'
2 @ 9'
8 @ 4'

1. Hot dip galvanized after fabrication

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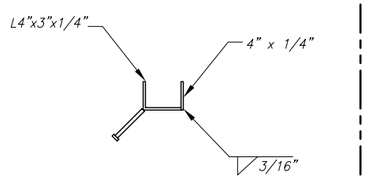
FISH PASSAGE AND PROTECTIVE FACILITIES

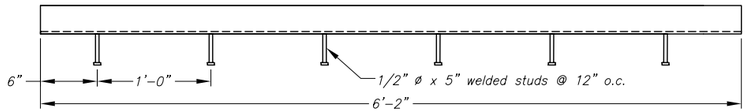
METHOW VALLEY IRRIGATION DISTRICT

MISCELLANEOUS EMBEDED METALWORK

DESIGNED Gwendolyn Christensen CHECKED Todd Hill
DRAWN Gwendolyn Christensen TECH. APPROVAL John Manfredi
PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
ACAD2000	16781559.DWG	
YAKIMA, WASHINGTON	AUGUST 28, 2003	1678-155-9





MK# 10-1, SLIDE GATE GUIDE, six required

1. Hot dip galvanized after fabrication

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METHOW VALLEY IRRIGATION DISTRICT

MISCELLANEOUS EMBEDDED METALWORK

DESIGNED Gwendolyn Christensen CHECKED Todd Hill
DRAWN Gwendolyn Christensen TECH. APPROVAL John Manfredi
PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
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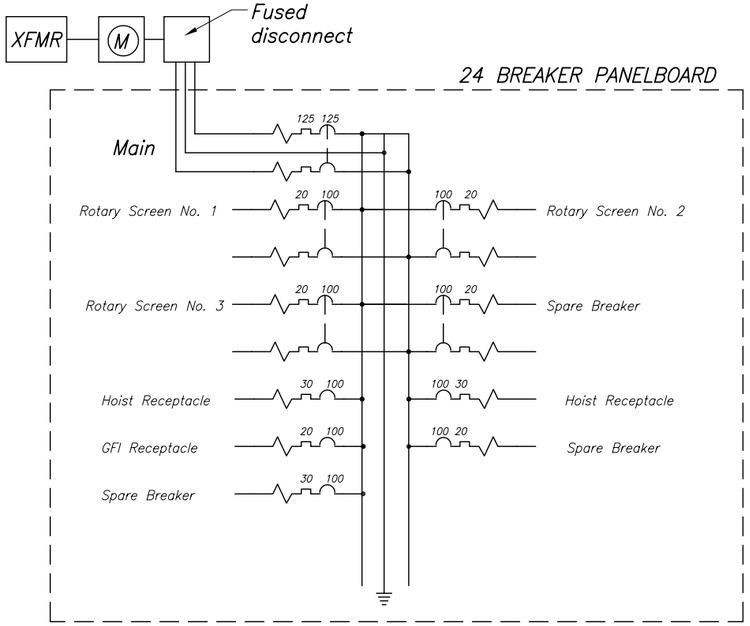
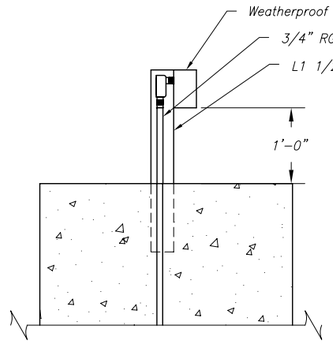
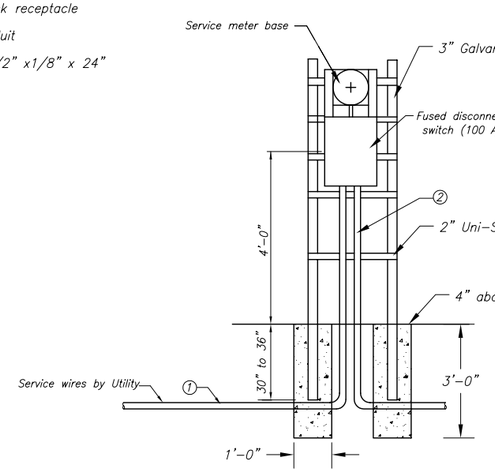
YAKIMA, WASHINGTON	AUGUST 28, 2003	1678-155-10



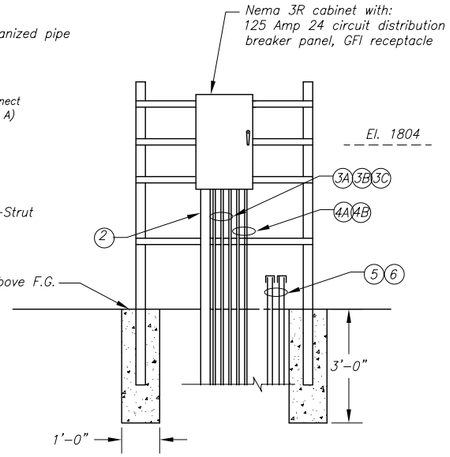


MOTOR RECEPTACLE

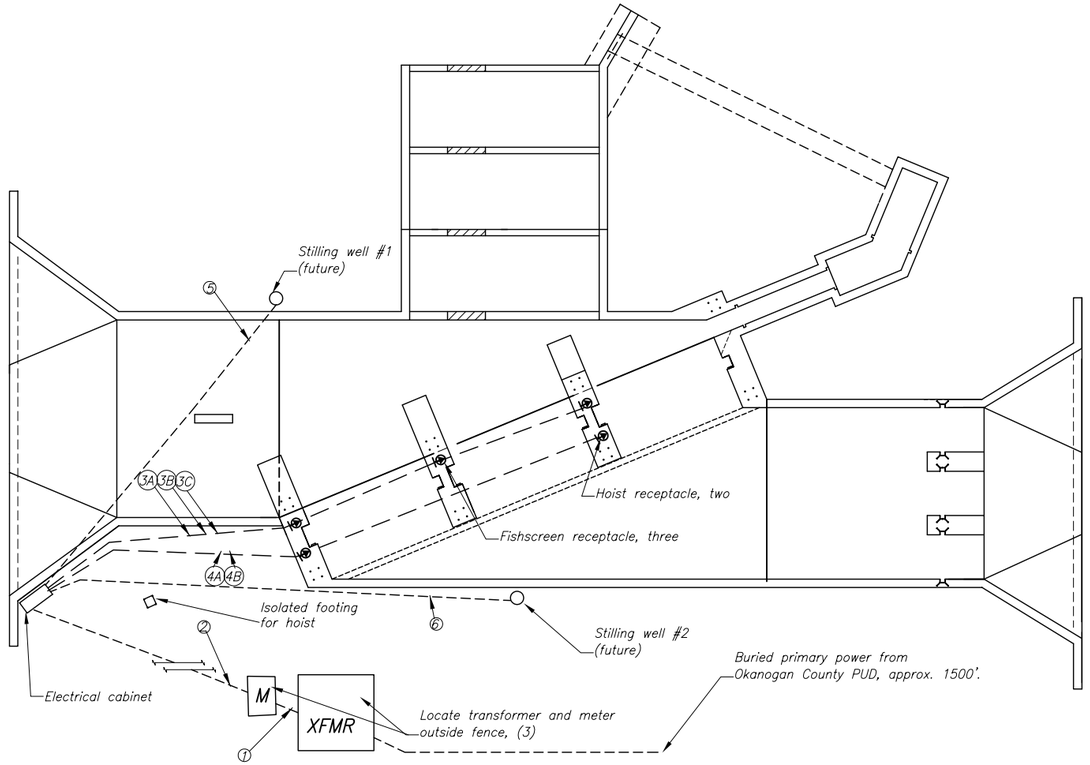
Three as shown for rotary screens, two similar blank boxes for hoist receptacles.



METER



ELECTRICAL CABINET



CONDUIT PLAN

CONDUIT & CABLE SCHEDULE

Conduit No.	Cable	Conduit Size	From	To	Remarks
1	By Utility		Service XFMR	Meter	Coordinate w/ Okanogan County PUD
2	4–1C No. 6	2"	Meter/Fused Disconnect	Breaker Panel	Buried
3A, 3B, 3C	4–1C No. 12	three – 3/4"	Breaker Panel	Fish Screen Motor Receptacles	Buried/Embeded conduits
4A, 4B	3–1C No. 10	two – 3/4"	Breaker Panel	Hoist Receptacles	Buried/Embeded conduits
5	Future	3/4"	Breaker Panel	Stilling Well #1	Buried, cap ends @ El. 1799.5/99
6	Future	3/4"	Breaker Panel	Stilling Well #2	Buried, cap ends @ El. 1799.5/99

See 104–D–757 for symbols

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FISH PASSAGE AND PROTECTIVE FACILITIES

METHOW VALLEY IRRIGATION DISTRICT

ELECTRICAL INSTALLATION

METER DISTRIBUTION PANEL , RECEPTACLES AND CONDUIT

DESIGNED Gwendolyn Christensen CHECKED Todd Hill

DRAWN Gwendolyn Christensen TECH. APPROVAL John Manfredi
PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
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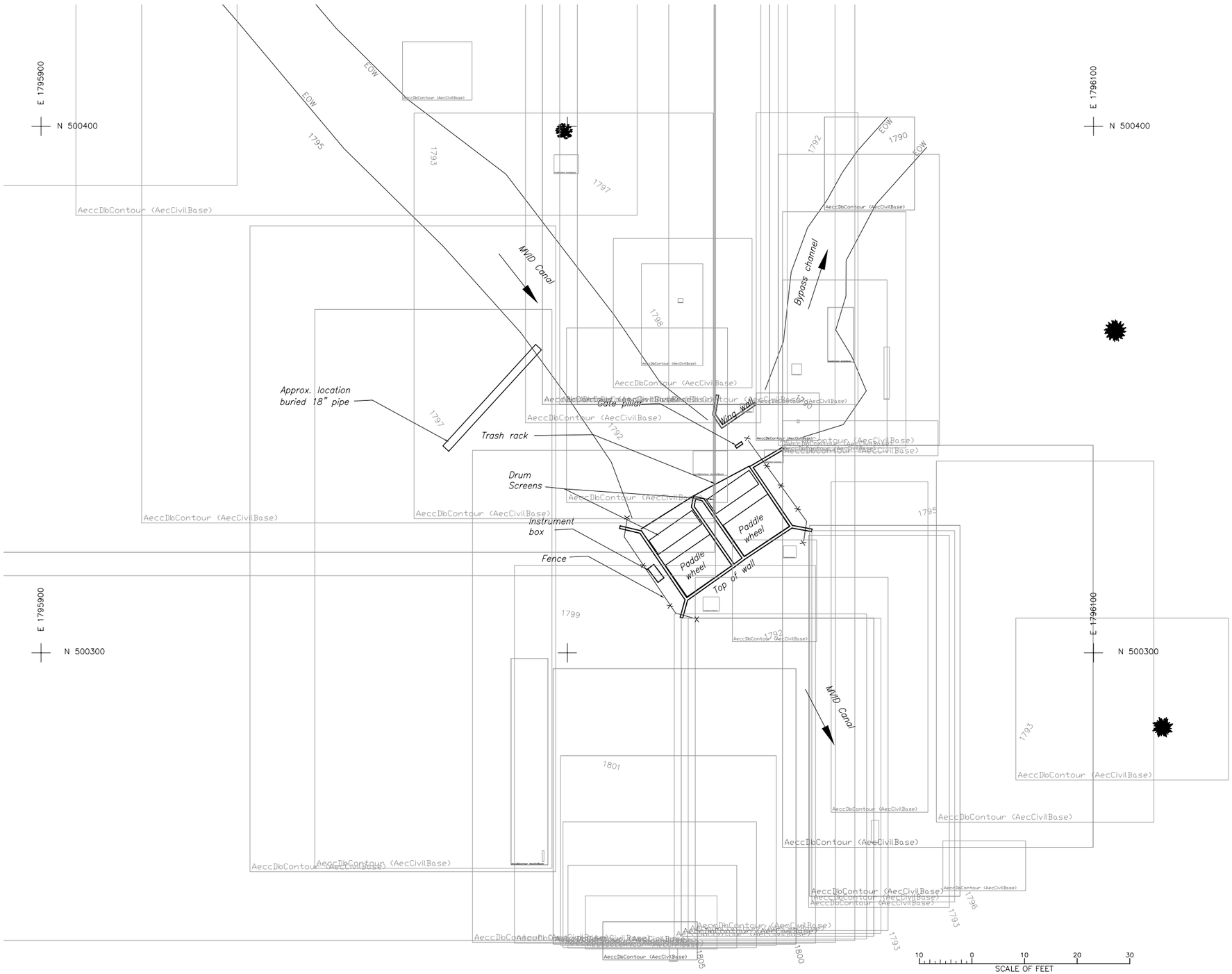
YAKIMA, WASHINGTON		1678–155–11



NOTES:

1. Remove and dispose of exisiting concrete structure, metalwork, wood, and fence.
2. Instrument box is to be removed by others prior to construction.
3. Remove and replace existing 18" pipe, 5 feet upstream of new fishscreen structure.

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METHOW VALLEY IRRIGATION DISTRICT

EXISTING FISH SCREEN STRUCTURE AND BYPASS

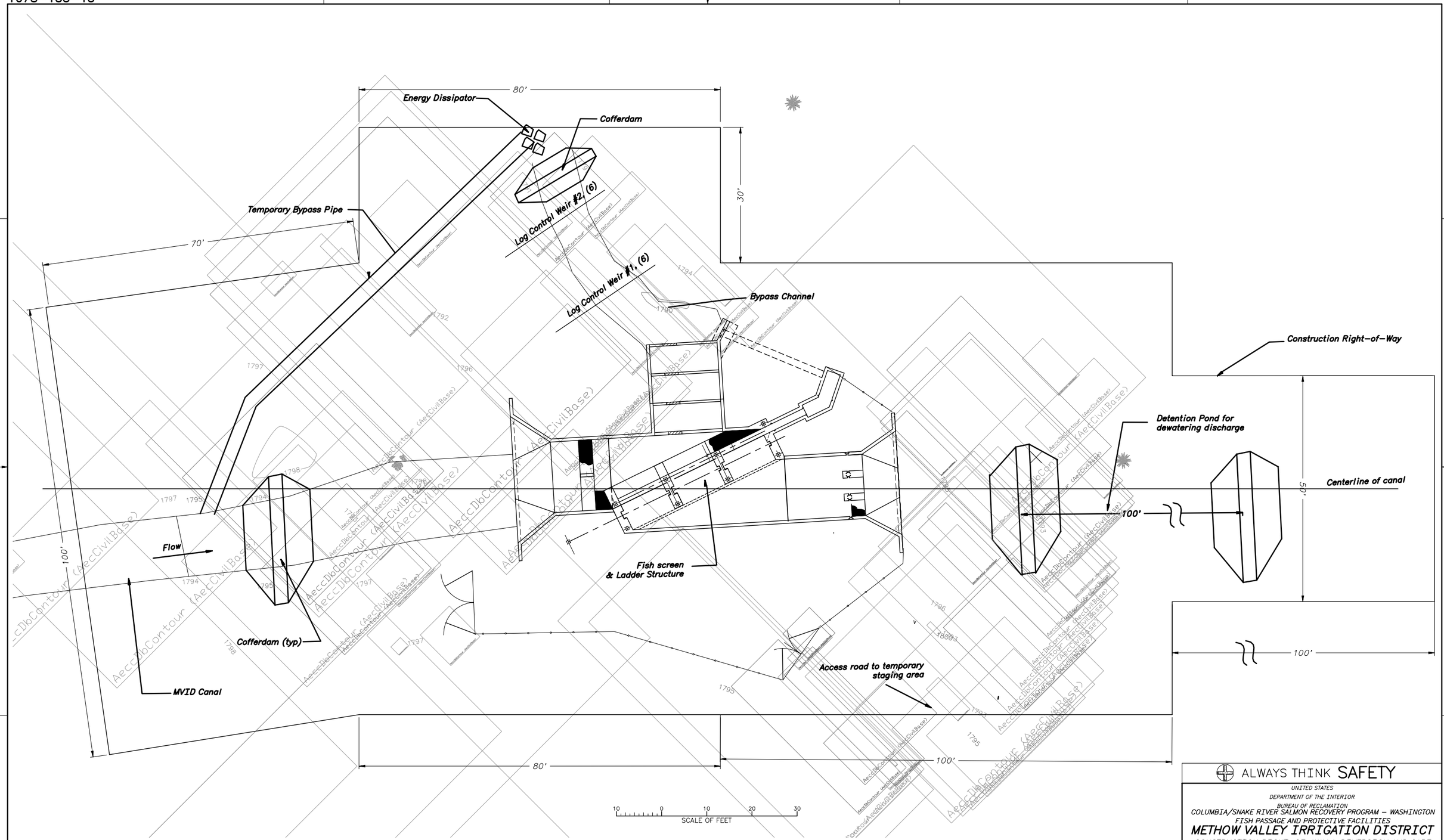
SITE PLAN

DESIGNED Gwendolyn Christensen CHECKED Todd Hill
DRAWN Gwendolyn Christensen TECH. APPROVAL John Manfredi
PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME
CADSYS	167815512.DWG
YAKIMA, WASHINGTON	AUGUST 28, 2003

1678-155-12

FILMFILE PLOTTED BY USER



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METHOW VALLEY IRRIGATION DISTRICT

CONSTRUCTION RIGHT-OF-WAY & DIVERSION AND CARE

LAYOUT

DESIGNED Gwendolyn Christensen CHECKED Todd Hill

DRAWN Gwendolyn Christensen TECH. APPROVAL John Manfredi
PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME
CADSYS	167815513.DWG
YAKIMA, WASHINGTON	AUGUST 28, 2003

1678-155-13

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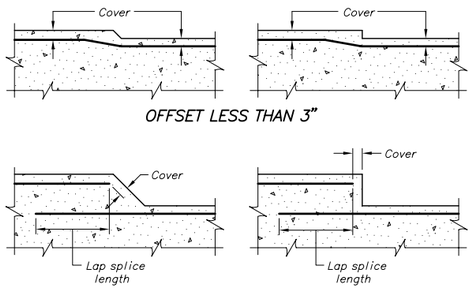


OFFSET LESS THAN 3"

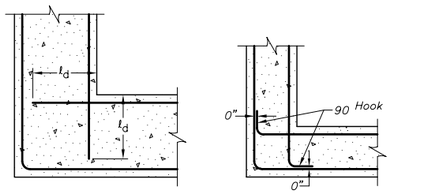
OFFSET 3" TO 8"

NOTE TO DESIGNERS AND DETAILERS: This detail may not be appropriate for tension areas of shallow structural members. If in doubt, use detail for offset greater than 8". See limits for noncontact lap splices in General Notes, Splices.

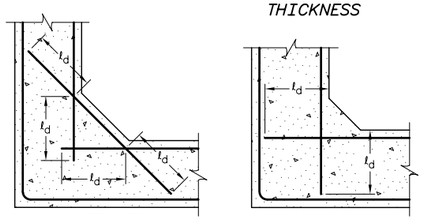
OFFSET GREATER THAN 8"

OFFSET GREATER THAN 8"
RESTRICTED MEMBER THICKNESS

TYPICAL OFFSET DETAILS



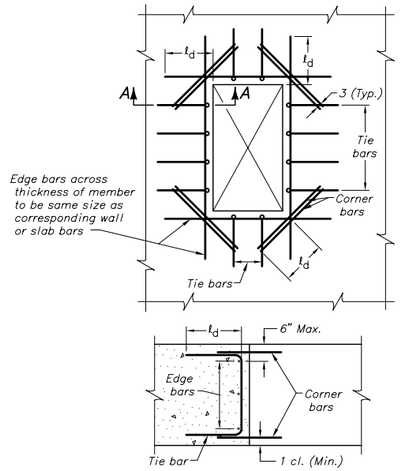
RESTRICTED MEMBER THICKNESS



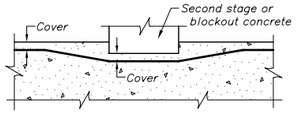
FILLET 1'-0" OR GREATER

FILLET LESS THAN 1'-0"

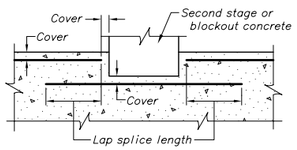
TYPICAL CORNER DETAILS



SECTION A-A

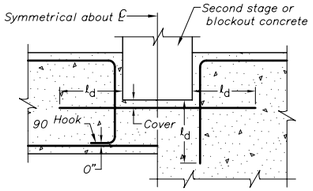


RECESS LESS THAN 3" DEEP



RECESS 3" TO 8" DEEP

NOTE TO DESIGNERS AND DETAILERS: This detail may not be appropriate for tension areas of shallow structural members. If in doubt, use detail for recess greater than 8". See limits for noncontact lap splices in General Notes, Splices.



RECESS GREATER THAN 8"

TYPICAL BLOCKOUT RECESS DETAILS

(Second stage concrete shown)

OPENINGS:

TABLE FOR ADDITIONAL REINFORCEMENT

MEMBER THICKNESS	TIE BARS	EDGE BARS	CORNER BARS
Less than 10	None	1 – ctr.	2 – #4 ctr.
10 thru 1–6	None	2 – (1 ef)	4 – #4 (2 ef)
1–7 thru 3–0	#4 @ 1–0	3 – eq. spc.	4 – #4 (2 ef)
Over 3–0	#6 @ 1–0	Spc. @ 1–0	4 – #5 (2 ef)

Omit edge and tie bars along sides of openings where dimension is less than 1'–6".
Omit corner bars at sides of openings adjacent to floors, walls, or beams.
Omit corner bars if both dimensions of opening are less than 1'–6".

RECESSES:

Use corner bars in face of recesses deeper than 4" if either dimension of recess is equal to or greater than 1'–6".

ADDITIONAL REINFORCEMENT AROUND OPENINGS AND RECESSES

GENERAL NOTES 1/

UNLESS OTHERWISE SHOWN ON THE REINFORCEMENT DESIGN DRAWINGS, THE DETAILS AND NOTES SHOWN ARE MINIMUM REQUIREMENTS AND TYPICAL FOR ALL REINFORCEMENT DRAWINGS THAT REFER TO THIS DRAWING

ABBREVIATIONS:

bf = bottom face
tf = top face
nf = near face
ff = far face
ef = each face
if = inside face
of = outside face
br = bottom row
tr = top row
nr = near row
fr = far row
er = each row
ir = inside row
or = outside row
mr = middle row
bl = bottom layer
tl = top layer
ml = middle layer
ns = near side
fs = far side
es = each side
ew = each way
ec = each corner
spc. = space or spaces
eq. spc. = equally spaced, equal spaces
d_b = nominal diameter or reinforcing bar
uv = uniformly varying lengths of bars between lengths shown
cl. = clear
ctr. = center or centers
add'l = additional
t_d = development length

SYMBOLS:

Bars shown thus —#8@1–0 or —#6@8 indicate a group of the same size bars equally spaced.
An open circle at the end of a bar indicates a bend with the bar turned away from the observer.
A closed circle at the end of a bar indicates a bend with the bar turned towards the observer.
Splices shown thus indicate a lap splice, not a bend in the bar.

DIMENSIONS:

Dimensions are to the centerline of the bars except for embedment of hooks, which are dimensioned to the outside of the bar.
Clear cover dimensions are marked "cl." and are dimensioned to the outside of the bar.

COVER:

Place the reinforcement so that the clear distance between face of concrete and nearest reinforcement is 1½" for #5 bars and smaller, 2" for #6 bars through #8 bars and 3" for #9 bars through #11 bars. Provide 3" clear distance from face of concrete for all bars when the concrete is placed against earth or rock. Clear distance is to the design dimension line.
Reinforcement parallel construction joints shall have a minimum of 2" clear cover.

PLACING:

Reinforcement at small openings (max. 1'–6") in walls and slabs may be spread apart not more than 1.50 times the bar spacing.
Reinforcement may be adjusted laterally to maintain a clear distance of at least 1" between the reinforcement and keys, water stops, anchor bolts, form ties, conduits, and other embedded materials. In heavily reinforced areas, relocation of the embedded material must be considered.
When bars are bent due to offsets less that 3" and recesses less that 3" deep, the slope of the inclined portion must not exceed 6 to 1.
Reinforcement parallel to anchor bolts or other embedded material shall be placed to maintain a clear distance of at least 1.33 times the maximum size aggregate.

SPACING:

The first and last bars in walls and slabs, stirrups in beams, and ties in columns are to start and end at a maximum of one half of the adjacent bar spacing. The minimum edge spacing shall be the smaller of either $2.5d_b$ or 0.5 of the adjacent bar spacing.

STANDARD HOOKS:

1. 180–degree bend plus $4d_b$ extension, but not less than 2½" at the free end of the bar.
2. 90–degree bend plus $12d_b$ extension at free end of the bar.

STIRRUP AND THE HOOKS:

1. #5 bar and smaller, 90–degree bend plus $6d_b$ extension at the free end of the bar.
2. #6, #7, and #8 bars, 90–degree bend plus $12d_b$ extension at the free end of the bar.
3. #8 bars and smaller, 135–degree bend plus $6d_b$ extension at the free end of the bar.

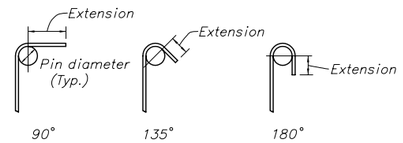


TABLE OF PIN DIAMETERS IN INCHES

BAR NO.	3	4	5	6	7	8	9	10	11
Standard bends	2 ¼	3	3 ¾	4 ½	5 ¼	6	9 ½	10 ¾	12
Stirrup and tie bends	1 ½	2	2 ½	4 ½	5 ¼	6			

REINFORCEMENT DOWELS:

Dowels indicated on the drawing, such as #8(d), shall be embedded a length equal to t_d and shall have a projection equal to that required for lap splicing to a bar of the same diameter.

PLAIN DOWELS:

Plain dowels across contraction joints shall be smooth bars uniformly coated with a film of oil before concrete placement. Viscosity of the oil shall have a SAE rating of not less than 250.

ACCESSORIES:

Bar supports, spacers, and other accessories are not shown on the design drawings. The recommendations of the ACI Detailing Manual–1988, or other approved supporting systems may be used.

DRAWING REFERENCES:

Numerals in parentheses ( ) following notes and section letters or numbers indicate the number of the drawing upon which the section or detail is shown; for example (524) denotes Drawing No. 557–D–524.

CODE AND DETAILING REFERENCES:

ACI Building Code Requirements for Structural Concrete (ACI 318–95).
ACI Detailing Manual – 1994.

NOTES TO DESIGNERS AND DETAILERS:

Splice lengths shown in the tables on this drawing are for Class B tension lap splices in accordance with ACI 318–95. Assumed conditions for these tables in addition to the requirements shown on this drawing are uncoated reinforcement, normal weight concrete, and the transverse reinforcement index (K_{tr}) equal to zero. Splices or development lengths other than those shown in the tables must be detailed on the reinforcement design drawings.

Some factors which require additional consideration are: Beams or columns with ties, lightweight aggregate concrete, epoxy–coated reinforcement, excess reinforcement, bars in compression, bundled bars, and seismic considerations.

1/ Unless otherwise shown on the reinforcement design drawings or this drawing, follow the recommendations established by the ACI Detailing manual – 1994.

SPLICES:

The minimum length of lap for splicing parallel bars shall be as given in the applicable table.
Staggered splices shall be separated to give 12 inches clear between ends of adjacent splices.
Bars spliced by noncontact lap splices shall not be spaced transversely farther apart than one–fifth the required lap splice length, nor 6" on centers.
When reinforcing bars of different size are to be spliced, the length of lap shall be governed by the smaller diameter bar.
Splices are to be made so that the required clear distances to face of concrete will be maintained.

f'c = 3000 psi TABLE 3 – 60 fy = 60,000 psi

BAR SIZE NO.	MINIMUM ℄ to ℄ BAR SPACING (INCHES)	LENGTH OF LAPPED SPLICE (INCHES)		DEVELOPMENT LENGTH t_d (INCHES)	
		TOP BARS *	OTHER BARS	TOP BARS *	OTHER BARS
3	3	17	16	13	12
4	3	23	18	18	14
5	4	28	22	22	17
6	5	34	26	26	20
7	6	49	38	38	29
8	6	56	43	43	33
9	7	63	49	49	38
10	8	71	55	55	42
11	9	79	61	61	47
9	6	63 **	49 **	49	38
10	6	75 **	58 **	58	45
11	6	93 **	71 **	71	55

f'c = 4000 psi TABLE 4 – 60 fy = 60,000 psi

BAR SIZE NO.	MINIMUM ℄ to ℄ BAR SPACING (INCHES)	LENGTH OF LAPPED SPLICE (INCHES)		DEVELOPMENT LENGTH t_d (INCHES)	
		TOP BARS *	OTHER BARS	TOP BARS *	OTHER BARS
3	3	16	16	12	12
4	3	20	16	15	12
5	4	25	19	19	15
6	5	29	23	23	18
7	6	43	33	33	25
8	6	49	37	37	29
9	7	55	42	42	33
10	8	62	47	47	37
11	9	68	53	53	41
9	6	55 **	42 **	42	33
10	6	65 **	50 **	50	39
11	6	80 **	62 **	62	48

* Top bars are all horizontal bars so placed that more than 12 inches of fresh concrete is cast below the development length or splice.
** Splices must be staggered.

6–1–97 D– G.P.G.	CONVERTED TO AUTOCAD DRAWING. REVISED TO CONFORM TO ACI 318–95. OTHER MINOR REVISIONS.
2–29–92 D– ROA	TOP BAR DEFINITION AND MINOR PUNCTUATION REVISION IN PLACING NOTE.
12–7–90 D– J.D.S.	REDRAWN TO NEW DRAFTING STANDARDS. REVISED CONCRETE COVER, NOTES TO DESIGNERS, TABLES, REINFORCEMENT AROUND OPENINGS, AND OTHER MINOR REVISIONS. REVISED TO CONFORM TO ACI 318–89.
9–27–84 D– NFP DG	REVISED PIN DIAMETER TABLE, REFERENCED THE ACI DETAILING MANUAL 1980. ADDED NOTES UNDER PLACING AND STANDARD HOOKS.
12–8–76 D– WRW	MINOR REVISIONS.

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BUREAU OF RECLAMATION

STANDARD DESIGNS

GENERAL NOTES AND MINIMUM REQUIREMENTS FOR DETAILING REINFORCEMENT

DESIGNED M.F.WARD J.G.STARBUCK CHECKED GAYLE A.ERICKSON
DRAWN M.CAMPBELL TECH. APPROVAL H.G.ARTHUR
ACTING DIRECTOR, DESIGN AND CONSTRUCTION

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AutoCAD Rel. 15.06	40–D–6263.DWG	APRIL 3, 2003 13:49
DENVER, COLORADO	JULY 12, 1972	40–D–6263

MISCELLANEOUS DESIGNATIONS

ALT _____ Alternator
A _____ Suffix designation for auxilliary control circuit
ASC _____ Adjustable speed controller
BFV _____ Butterfly valve
C or CAP _____ Capacitor
CB _____ Circuit breaker
CLF _____ Current limiting fuse
CNT _____ Counter
DV _____ Discharge valve
EXC _____ Exciter
FU _____ Fuse
GFCI _____ Ground fault circuit interrupter
GRD _____ Ground
GRS _____ Galvanized rigid steel conduit
GV _____ Gate or guard valve
HR _____ Hand reset (Use as suffix)
I _____ Input
IL _____ Indicating lamp, add prefix for color
IMC _____ Intermediate steel conduit
MCE _____ Motor control equipment (2500 - 5000 volts)
M _____ Motor
MCC _____ Motor control center (600 - volts and lower)
NP _____ Nameplate
NC _____ Normally closed
NO _____ Normally opened
NSPB _____ Nonsegregated phase bus
O _____ Output
PB _____ Pushbutton (Momentary contact type)
PBM _____ Pushbutton (Maintaining contact type)
PC _____ Programmable controller
PR _____ Probe operated relay (Refer to FS for suffix)
REC _____ Rectifier
R/I _____ Resistance to current transducer
SF _____ Service factor
SO _____ Solenoid oiler
SV _____ Solenoid operated valve
TE _____ Time delay on energization
TD _____ Time delay on deenergization
TT _____ Thermal switch
V/I _____ Voltage to current transducer
VLV _____ Valve
WL _____ Water level contact on telemeter receiver (Refer to FS for suffix)

WRM _____ Wound rotor motor
X,Y,X _____ Suffix for auxiliary relay, switch, or contactor (ALX,CSX,FLX, ect.)

-1,-2,-3, etc. _____ Suffix for unit number for pumping units, gates, valves, ect.

1,2,3, etc. _____ Suffix for electrical device numbering, such as TR1, TR2, ect.

* _____ Estimated rating

RELAY DESIGNATIONS

AL _____ Alarm relay
BG _____ Bearing temperature relay
CR _____ Control relay
FL _____ Field loss relay
FR _____ Field application relay
GP _____ Ground protective relay
IS _____ Incomplete sequence relay
LO _____ Lockout relay
OC _____ Overcurrent relay
OL _____ Overload relay
OV _____ Overvoltage relay
PO _____ Pullout (Loss of synchronism relay)
RC _____ Remote control relay
RSR _____ Remote sensing relay
SC _____ Squirrel cage (damper winding(relay
SR _____ Shift register
TR _____ Time delay relay
UF _____ Under frequency relay
UV-OPR _____ Undervoltage single and reverse phase relay
WT _____ Winding temperature relay

CONTACTOR DESIGNATIONS

FC _____ Field contactor
LC _____ Lighting contactor
M _____ Main contactor
MA _____ Air compressor motor contactor
MF _____ Vent fan motor contactor
MG* _____ Gate motor contactor
MO* _____ Oil pump motor contactor
MV* _____ Valve motor contactor
*Use suffix as application
-C Closing function
-L Lowering function
-O Opening function
-R Rasing function
S _____ Starting contractor
1S _____ Start contactor
2S _____ Start transition contactor } Reduced voltage starting
R _____ Run contactor

SWITCH DESIGNATIONS

CS _____ Control switch
FCD _____ Foreign circuit disconnect switch
FS _____ Float switch (Use suffix letter__ C-canal, P-pipe, R-reservoir, S-sump, T-tank)
LS _____ Limit switch
PS _____ Pressure switch
SS _____ Selector switch
TQ _____ Torque switch
TSW _____ Transfer switch

TRANSFORMER DESIGNATIONS

CCT _____ Control circuit transformer
CT _____ Current transformer
PT _____ Potential transformer
T _____ Transformer
TH _____ Transformer oil temperature
TL _____ Transformer oil level
TP _____ Transformer pressure relief
SST _____ Station service transformer

INSTRUMENT AND METER DESIGNATIONS

AM _____ Ammeter
AS _____ Ammeter transfer switch
CNT _____ Start counter
INT _____ Integrating instrument
PF _____ Power-factor meter
PST _____ Phase shifting transformer
RDM _____ Recording demand meter
TM _____ Time meter
V _____ Voltmeter
VAR _____ Varmeter
VARH _____ Varhour meter
VS _____ Voltmeter transfer switch
W _____ Wattmeter
WH _____ Watthour meter
WHD _____ Watthour demand meter
(R) _____ Indicates recording instruments
The asterisk is not part of the symbol.
Replace the asterisk with letter or letters depending on the function of the instrument.

DEVICE SYMBOLS

CS — Control switch
AS — Ammeter transfer switch
VS — Voltmeter tansfer switch
Surge arrester
Capacitor
Reactor
Potential transformer
Current transformer
Power or distribution transformer
3Ø, Wye grounded connection
3Ø, Delta connection
3Ø, Broken delta connection
3Ø, Open delta connection (corner grounded)

Disconnecting switch
Liquid level switch (Normally open)
Vacuum and pressure switch (Normally closed)
Temperature actuated switch (Normally open)
Flow actuated switch (Normally open)
Limit switch-direct actuated (Normally open)
Torque switch (Normally closed)
3-Position selector switch
Air circuit breaker thermomagetic trip 1 Frame size, 2 Inverse time trip, 3 Instantaneous trip
1 Rectifier, 2 Reactor, 3 Inverter
Silicon controlled rectifier (Solid state DC switch)
Air circuit breaker, electrically operated
Air circuit breaker, withdraw type
Contactor with thermal trip
Contactor with magnetic trip
Contactor with CT and magnetic trip relay
Contactor (Normally open)
Contactor (Normally closed)
Auxiliary contactor (Closes when main device is closed)
Auxiliary contactor (Open when main device is closed)
Relay contact number
Relay coil, contactor coil
Horn-gap disconnectiong switch
Fuse
Fuse, current limiting type
Instrument shunt
Resistor
Rheostat, or potentiometer
Separable connector
Indicating lamp W-white, R-red, G-green, Y-yellow, A-amber, B-blue
Battery
Bell
Horn
Pushbutton (Normally open, momentary contact)
Pushbutton (Normally closed, momentary contact)
Maintained contact pushbutton

Probe, water level detector
Load interrupter switch
Motor
Triac (Solid state AC switch)
Wound rotor motor

WIRING SYMBOLS

Ground connection
Interconnection between separately owned systems
Duplex single-gang plug receptacle
Single weatherproof plug receptacle
Watertight three-phase power receptacle
Single pole switch
Three way switch
Luminaire, letter indicates type, number indicates wattage
Represents connection from external equipment. Does not necessarily represent a terminal block.
High voltage cable termination
Represents connection from external equipment via-multi-pair control (signal) cable.

GROUND SYMBOLS

Cable exposed
Cable embedded in concrete
Cable concealed but not embedded
Cable buried directly in earth
Ground rod
Welded or bolted connection
Cable riser
Indicates ground when required for clarity
Ground connector per 40-D-4334, Fig. 4
Ground ring

CONDUIT SYMBOLS

Exposed
Embedded in concrete
Concealed but not embedded
Buried directly in earth
Bending toward observer
Bending away from observer
Capped
Pull box or junction box
Designation number
Liquid tight flexible metal conduit
Sealing bushing, conduit to cable

NOTES

1. If designations and symbols other than the ones shown on this drawing used, they shall be shown on the appropriate drawing.
2. For additional designations and symbols refer to NEMA Standards Pub, ICS-1970.
3. Contacts in control circuits are shown in the deenergized position. Liquid level switches are shown with liquid container empty. Vaccum and pressure switches are shown at ambient pressure. Temperature switches are shown at ambient temperature.

3 - 24 - 00 D - L.G.	REVISED TITLE BLOCK AND REDRAWN IN AUTOCAD 14.
3 - 11 - 81 D - D.G.	MINOR REVISIONS

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS

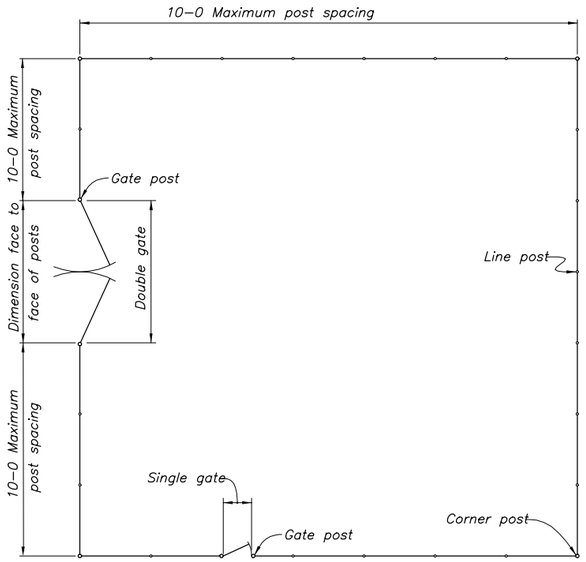
PUMPING PLANT
ELECTRICAL INSTALLATIONS
DESIGNATIONS AND SYMBOLS

DESIGNED	N.J.B.	TECH. APPR.	P.L. ANNA
DRAWN	D.D. DROULLARD	SUBMITTED	S.M. DENTON
CHECKED	E.M.T.	APPROVED	M.H. KIGHT

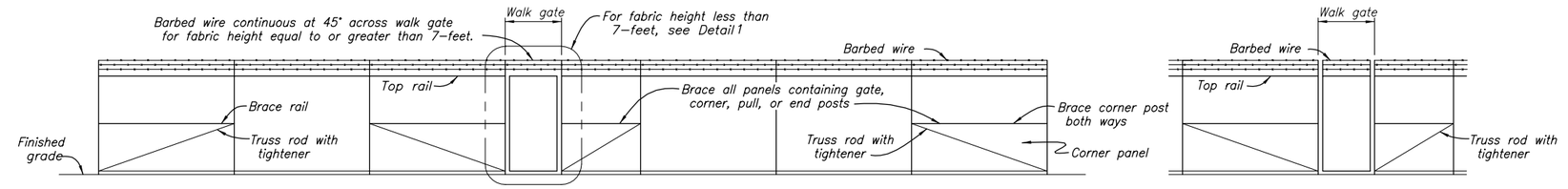
CHIEF, ELECTRICAL BRANCH

CADD SYSTEM AutoCAD Rel. 15.0 DENVER, COLORADO	CADD FILENAME 1040757.DWG FEBRUARY 13, 1962	DATE AND TIME PLOTTED AUGUST 9, 2000 14:29

104-D-757

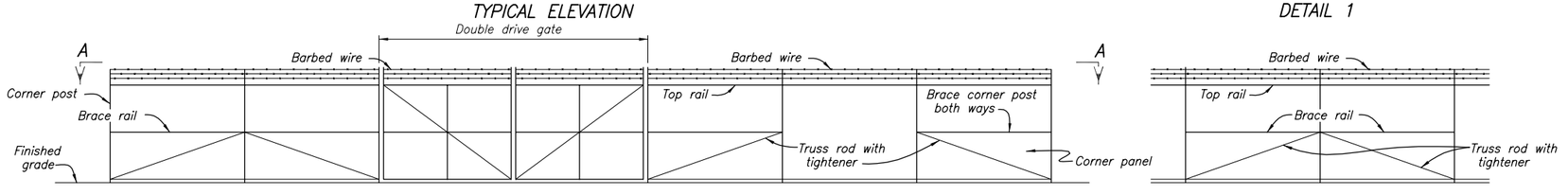


TYPICAL FENCING PLAN



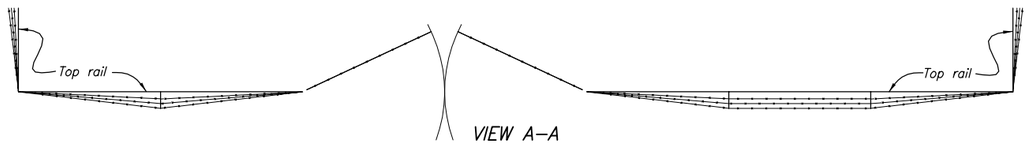
TYPICAL ELEVATION

DETAIL 1

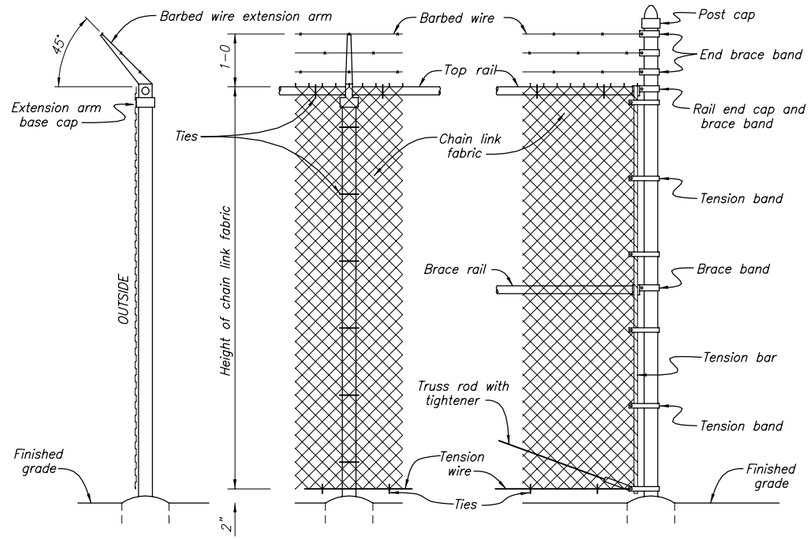


TYPICAL ELEVATION

PULL POST

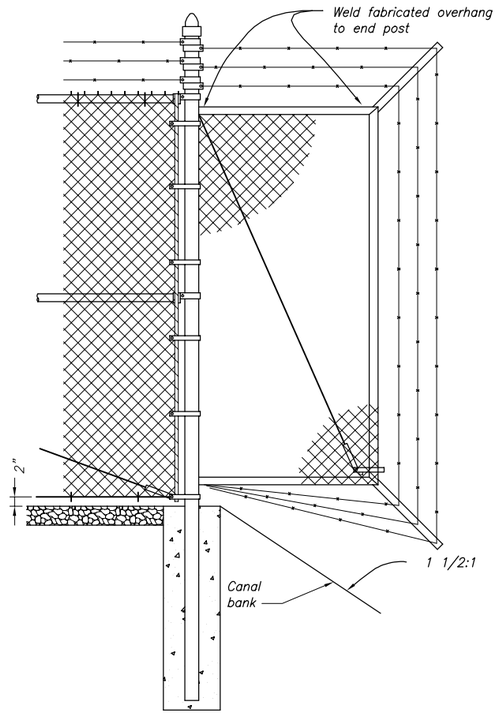


VIEW A–A

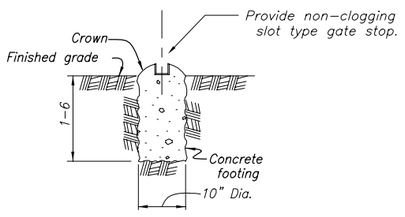


LINE POST

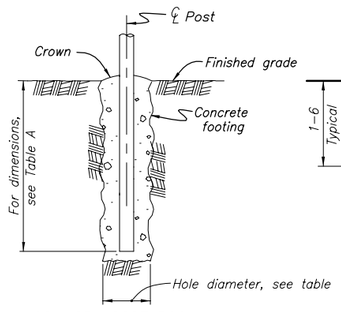
END POST, CORNER POST, OR GATE POST



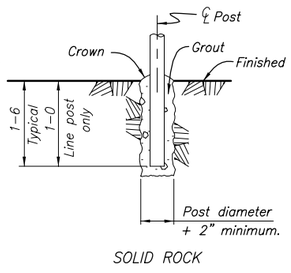
FENCE OVERHANG DETAIL



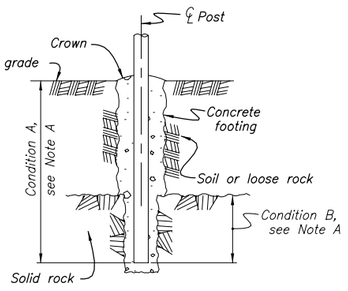
GATE STOP FOOTING



SOIL OR LOOSE ROCK



SOLID ROCK



POST FOOTING IN SOLID ROCK WITH OVERBURDEN OF SOIL OR LOOSE ROCK

TABLE A

POST FOOTING SIZES IN SOIL OR LOOSE ROCK				
POST	FABRIC HEIGHT	HOLE DIAMETER AT TOP	HOLE DEPTH	POST EMBEDMENT
Line	*3 ft. to 4 ft.*	*6 inches*	*24 inches*	*21 inches*
Line	*5 ft.*	*8 inches*	*30 inches*	*27 inches*
Line	*6 ft. to 12 ft.*	*9 inches*	*38 inches*	*36 inches*
Terminal	*3 ft. to 5 ft.*	*10 inches*	*32 inches*	*30 inches*
Terminal	*6 ft. to 12 ft.*	*12 inches*	*38 inches*	*36 inches*

Note A: Satisfy Condition A or Condition B.
Condition A: Depth required for footing in soil or loose rock.
Condition B: Depth required for embedment in rock.

NOTES

All fencing materials and accessories shall be in accordance with the specifications and the Chain Link Fencing Manufacturers Institute (CLFMI) standards.
All post and frame dimensions shall be in accordance with Table 4 (CLFMI). Concrete footing dimensions shall be in accordance with Table A above.
See site plans for fence layout and swing of gate.
Install pull posts at a maximum interval of 500 feet and at changes in horizontal or vertical alignment.
Weld all joints between tubular gate frame members and frame overhangs or use heavy fittings to provide rigid and watertight connections.
Provide latches, stops and keepers for all gates as specified.
End posts, corner posts, pull posts, and gate posts are designed as terminal posts.
Brace rails are not required for fabric less than 6 feet high.
For typical grounding details, see 40–D–4334, 40–D–4335 and 40–D–6376.

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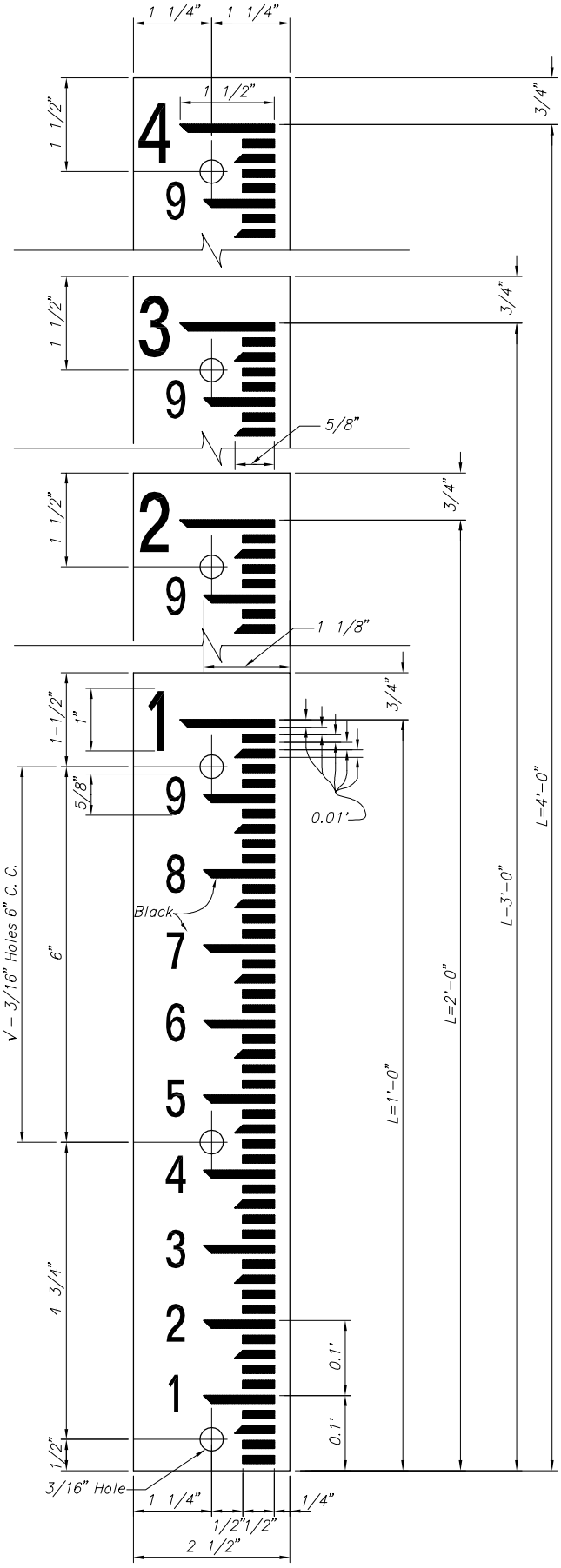
BUREAU OF RECLAMATION

STANDARD DRAWINGS

CHAIN LINK FENCING DETAILS

DESIGNED CLFMI STANDARD
DRAWN Charles H. Ferguson
CHECKED Douglas K. Wise
TECHNICAL APPROVAL M. Schuyler
APPROVED Brent Mattson
PROJECT CONSTRUCTION ENGINEER

Cadd System: AutoCAD Release 13	Filename: YAK255.DWG	Date and Time Plotted: April 17, 1997
YAKIMA, WASHINGTON CADD	FEBRUARY 1997	1022–155–255



NOTES:

Gages to be of No. 18 gage (U.S. standard) mild steel plate and to be covered with porcelain enamel with a minimum thickness of 12 mils on numeral side and 3 mils on the reverse side and on edges where plate has been cut, punched or drilled.

All cutting, drilling and punching of the plates shall be completed before the porcelain enamel is applied.

The face of the gage shall be white and all numerals and graduations shall be black.

Graduations shall be sharp and accurate to the dimensions shown.

The length "L" shall be as given in the schedule. In case a greater length than 4'-0" is required the details shall be similar to details shown for shorter lengths.

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BUREAU OF RECLAMATION

STANDARD DESIGNS

ENAMELED WEIR GAGES

DESIGNED _____ TECH. APPROVAL _____

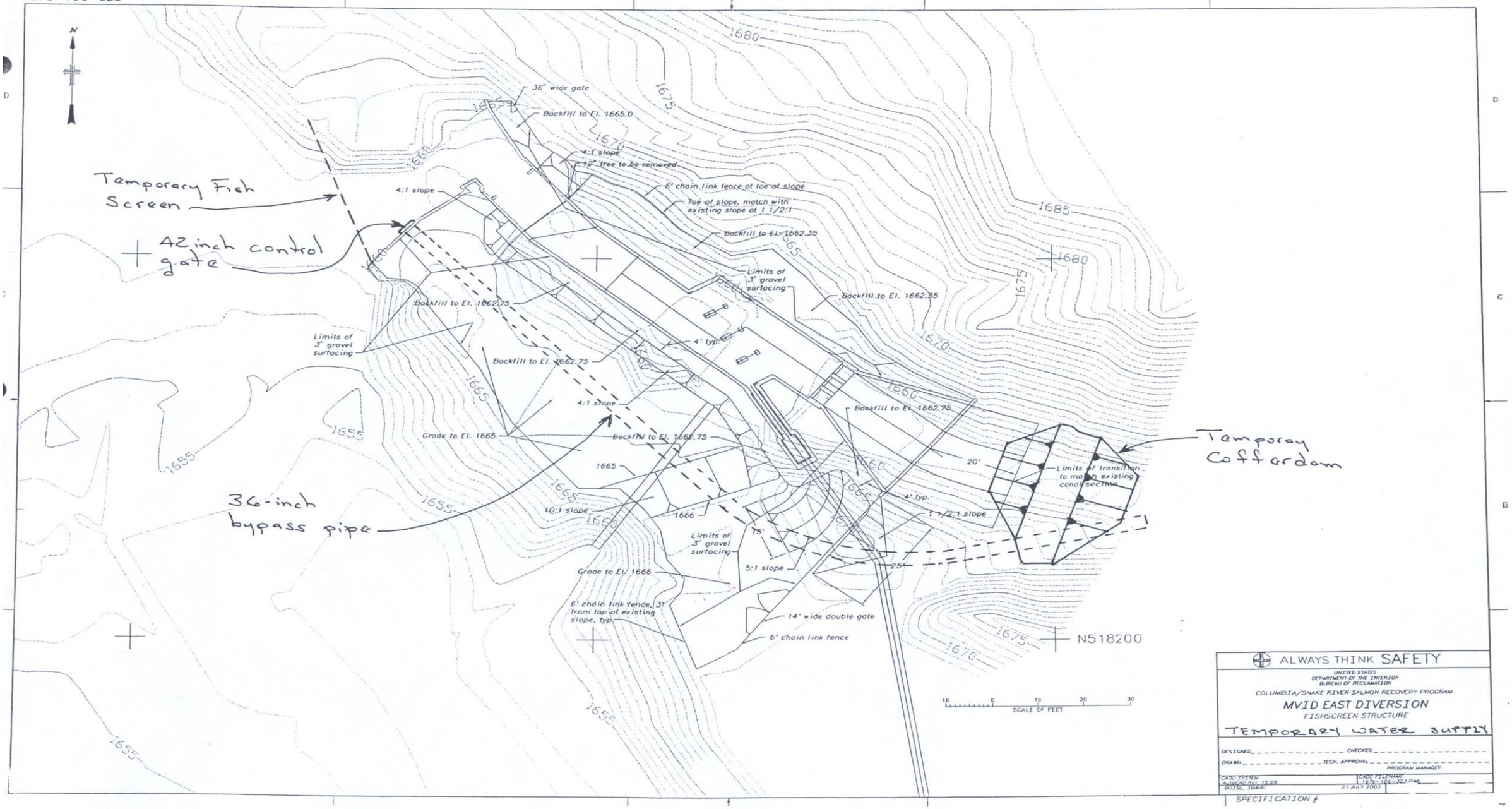
DRAWN I. Lawyer _____

CHECKED _____ APPROVED _____

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AutoCAD Rel.12	9003-100-217.DWG	JULY 15, 1996 09:56
BOISE, IDAHO	FEBRUARY 1995	9003-100-217

APPENDIX C
MVID East Temporary Water Diversion

1678-100-323



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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

MVID EAST DIVERSION

FISHSCREEN STRUCTURE

TEMPORARY WATER SUPPLY

DESIGNED _____ CHECKED _____

DRAWN _____ TECH. APPROVAL _____

PROGRAM MANAGER

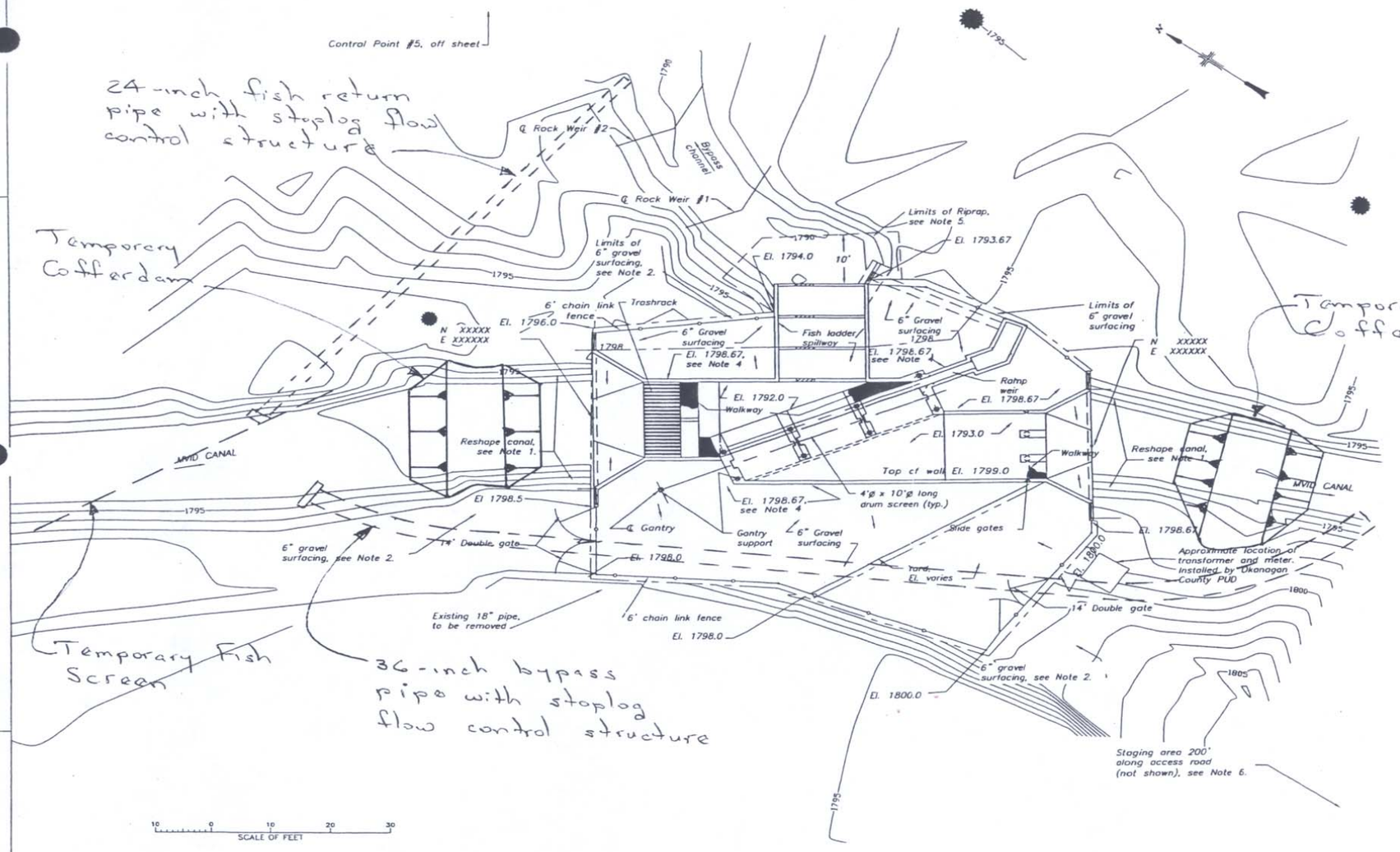
CADD SYSTEM: AutoCAD Rel. 13.0E
BOISE, IDAHO

CADD FILENAME: 1678-100-323.DWG

21 JULY 2003

SPECIFICATION #

APPENDIX D
MVID West Temporary Water Diversion



PLAN

NOTES:

1. Reshape canal as directed 20' upstream and downstream from concrete transitions.
2. Gravel surface within fenceline and 20 ft. outside fence at gate openings.
3. Existing ground contours shown outside of structures and fence limits. Slope finish grade from 1' outside fenceline on 1.5:1 to meet existing ground, except 10:1 outside gates.
4. Finished grade around concrete structure walls El. 1798.67, unless otherwise shown. Slope finish grade uniformly from structure to breaklines and point elevations shown 1' outside fenceline.
5. Riprap bypass channel, invert, and finish channel slopes to elevation 1794.0.
6. Staging area is located along access road approximately 200 ft. south of screen site and is x by x.
7. Survey information: Site was surveyed October 2002. Basis of Bearing = Washington State Plane North Zone Coordiante System NAD 83. Horizontal Control = Washington State Plane North Zone Coordiante System North Zone NAD 83. Based on GPS Observation from DOT BC F378. Vertical Control = North American Vertical Datum of 1988 Based on GPS Observation from DOT BC F378.
8. Referece drawing 1678-155-12 for existing screen and spillway demolition.

SURVEY CONTROL:

POINT	Northing	Easting	Elevation
1707	XXXXX	XXXXXXX	XXXXX
5	XXXXX	XXXXXXX	XXXXX

LEGEND:

1798	Finished grade breakline, elevation, see Note 4.
El. 1796.0	Finished grade point: elevation, see Note 4.
△	Survey control points, see Note 7.

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BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM - WASHINGTON
FISH PASSAGE AND PROTECTON FACILITIES

METHOW VALLEY IRRIGATION DISTRICT
WEST FISH SCREEN STRUCTURE
TEMPORARY WATER SUPPLY

DESIGNED	CHECKED
DRAWN	TECH. APPROVAL
	PROGRAM MANAGER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AUTOCAD2000	1678155312MC	
YAKIMA, WASHINGTON	JULY 31, 2003	